State of California
The Resources Agency
Department of Water Resources
Northern District

Smith River Plain Ground Water Study

December 1987

FOREWORD

It has been 21 years since the Department of Water Resources published the comprehensive ground water quality investigation, Bulletin 74-3, "Water Well Standards, Del Norte County". During the interim period, a number of wells have been sampled and measured in Del Norte County to monitor major ground water basin changes. In 1985, that monitoring grid consisted of seven wells measured twice a year for water levels and five wells sampled once a year for water quality.

This study was undertaken to expand our knowledge of the geologic and hydrologic conditions that exist in the Smith River Plain Basin, determine the availability of ground water and its quality, and re-evaluate the monitoring wells to ensure that the wells are the most representative of basin conditions.

The report concludes that, except for localized impairment, ground water in the Smith River Plain Ground Water Basin is of excellent quality and is suitable for most beneficial uses. Ground water is unconfined throughout the basin and therefore relatively unprotected from surface contamination. Discharge of wastes and use of toxic materials need to be carefully controlled to prevent pollution. It also concludes that updated and expanded water quality and water level monitoring grids should be implemented. The report recommends that existing well sealing standards be enforced, especially in areas where toxic materials are used.

Wayne S. Gentry

Wayne S. Gentry, Chief
Northern District

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The Regional Water Quality Control Board staff helped run seismic lines and measured water levels throughout the study period. The County Department of Public Works began monthly water level monitoring in May 1987 and will continue for at least the coming year.

INTRODUCTION

This ground water update was undertaken to expand our knowledge of the geologic and hydrologic conditions that exist in the Smith River Plain basin and to determine the availability of ground water and its quality. This report presents data and interpretations that will provide a better basis for decisions related to the protection, development, and use of the valuable water resources of this basin.

Area of Investigation

The Smith River Plain Ground Water Basin is in Del Norte County in the extreme northwest corner of California (Figure 1). The plain is bordered by the Pacific Ocean on the west and the foothills of the California Coast Ranges on the east. The plain has an area of about 110 square miles, with a north-south length of about 20 miles and a maximum width of about 6 miles. This area is subrectangular in shape, pinching out to the south against the steep scarp of the mountainous headland. The north end of the plain narrows abruptly at the mouth of Smith River to a marine terrace less than one mile wide that continues north into Oregon. The Smith River crosses the northern portion of the plain near the town of Smith River.

Lake Earl, a shallow, brackish body of water, occupies nearly 2,100 acres near the central portion of the Smith River Plain. This lake is intermittently connected to the Pacific Ocean via a narrow neck of water and Lake Talawa. It is subject to periodic flooding from surface water runoff and during drier months is sustained by ground water discharge.

Crescent City, the largest city in the county, has a population of 2,960 with a suburban population of about 6,800. Within the plain, about 5,700 acres are presently irrigated for lily bulbs and pasture.

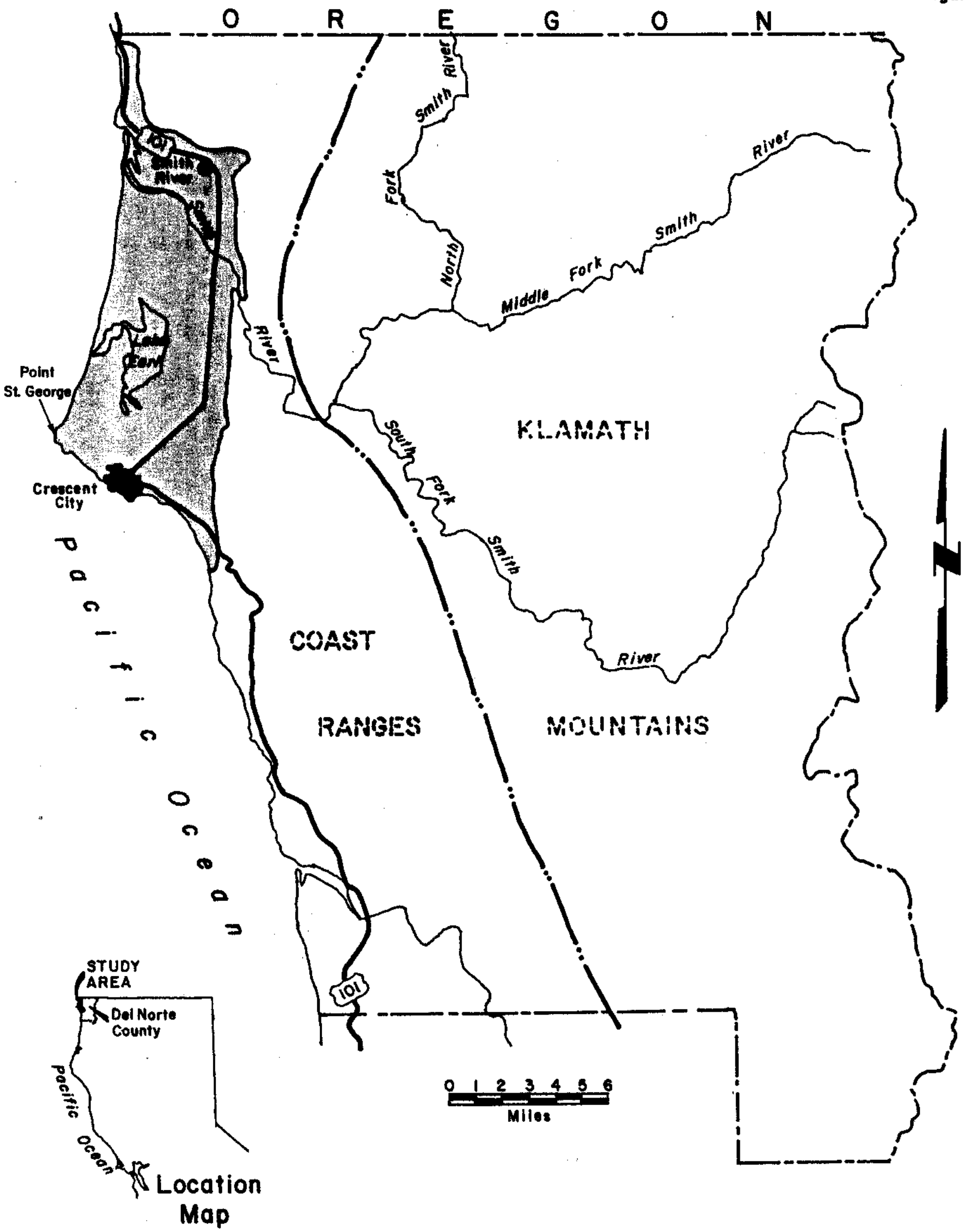
Purpose and Scope

Many rural communities are experiencing inadequate water supply and water quality and sewage-disposal problems. Also, they lack basic data on their area's water resources and often have neither the finances nor the staff to develop these data on a regional scale. To help these rural areas, the State has been providing the Department of Water Resources with funding to conduct this type investigation.

Some water wells in the Smith River Plain's ground water basin contain unacceptably high levels of two nematocides (aldicarb and 1,2-dichloropropane), which were used in lily production until suspended in 1983 by the County Agricultural Commissioner. In other areas of the basin, high nitrate levels have been found in domestic wells, and waste disposal sites exist that may represent threats to the local ground water resource.

This study, besides updating knowledge of the geology and hydrology of the entire basin, will enable DWR to re-evaluate its basic data monitoring

Figure I



Location of Smith River Plain Ground Water Basin program. New water level and water quality wells may be added to ensure that the monitoring is representative of basin conditions. Del Norte County needed a basic data report that would enable them to make sound planning decisions on their future water development and waste discharge. In turn, they provided staff assistance in gathering water-level and land-survey data. Concurrent with our study, the California Regional Water Quality Control Board, North Coast Region, (RWQCB) has been sampling wells and studying the soils near Smith River to determine the extent and character of nematocide contamination. They requested a geohydrology report in that portion of the basin. That report will be completed in December 1987 under a $35,000 study partially funded by EPA 205j funds, administered by RWQCB, Santa Rosa.

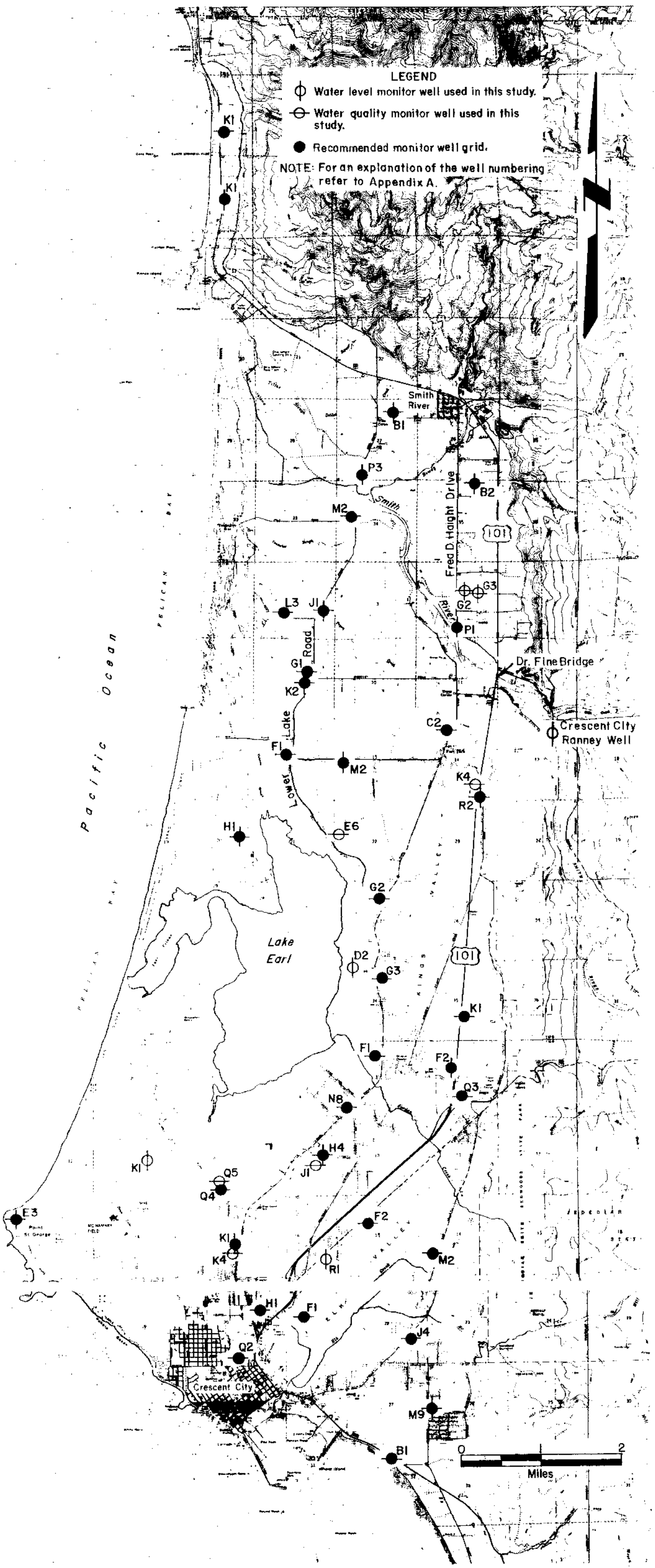
Methods

Work on this investigation began in July 1985 with a literature survey at the State Resources library and the Humboldt State University and Del Norte County libraries. Monitoring at that time consisted of seven water-level wells measured twice a year and five water-quality wells sampled once a year. Most of the wells were drilled in the 1950s or earlier and did not have Well Drillers Reports. Recent, complete Well Drillers Reports were selected from our files, field located, and documented with official State numbers (Appendices A and B). These located wells were used to monitor water levels and water quality throughout the basin. Where drillers information was lacking, nine seismic refraction lines were run to determine the depth to bedrock.

In addition to the periodic water-level measurements, four continuous water-level recorders were installed to track water-level changes. These recorders have recently been moved to Lake Earl for an ongoing study in that area. In the spring of 1987, water-level contours were drawn using 105 measured wells from throughout the basin and a measurement grid was selected (see Figure 2). Standard mineral analyses were run on 29 well water samples during the summer of 1986. Temperature, pH, and electrical conductivity (EC) were run in the field at the time of collection. The samples were analyzed at the Department's chemical laboratory at Bryte. These data, coupled with RWQCB water-quality analyses made near Smith River, provide a good overview of the ground water quality in the basin and were used to redesign our water-quality monitoring grid (Figure 2). All the new wells have been qualified according to their producing strata and/or formation (see Appendix B).

Previous Studies

In 1953, the U. S. Geological Survey (USGS) and California Division of Water Resources made a reconnaissance study of the ground water conditions of the Smith River Plain. The results of that investigation were published in USGS Water Supply Paper 1254. In 1966, at the request of Del Norte County, the Department of Water Resources investigated water quality conditions in the ground water throughout the County. This study was published as Bulletin 74-3, "Water Well Standards, Del Norte County". These two studies are the main background reports on the regional occurrence of ground water in the Smith River Plain. The hydrogeologic reference material compiled during this study that provided new information came mainly from site investigations connected with the Del Norte County Prison studies (J. H. Kleinfelder and Associates) and a hazardous waste site study near the county airport (Woodward-Clyde Consultants). Both consulting firms provided written material, subsurface information, and helpful discussions on the area's geology and hydrology.



Location of Monitored Wells
Smith River Plain

Figure 2

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REGIONAL GEOLOGY

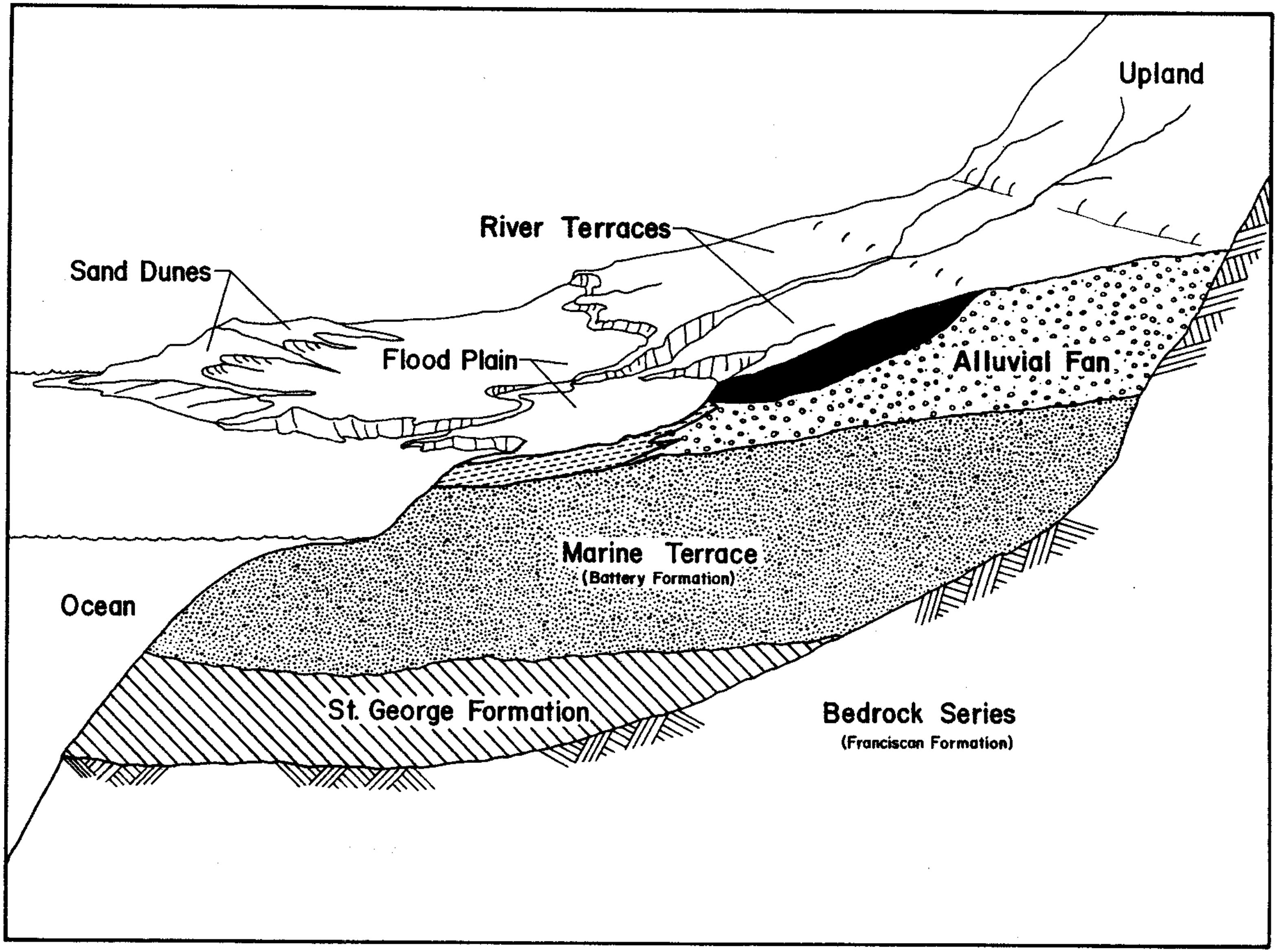
The Smith River Plain ground water basin is in the extreme northwest corner of the State (Figure 1). It is bordered on the west by the Pacific Ocean and on the east by the California Coast Ranges.

The Smith River Plain is a large terrace consisting of the Battery and St. George Formations overlying Franciscan Complex bedrock. The terrace is partially covered by sand dunes and stream alluvium. It was formed by the emergence of a shallow submarine platform during late Pleistocene time. The western edge of the platform, from Point St. George north to the mouth of Smith River, consists of a broad sand beach. From Point St. George south to Crescent City, the platform is terminated by a 50-foot-high sea cliff above a narrow beach. A similar beach and low sea cliff extend along the coastal strip north of Smith River into Oregon. A broad sandy beach extends southeast from Crescent City to the base of the rugged headland at the southern tip of the plain.

The eastern side of the platform is bordered by a remarkably straight, north-south escarpment forming the western front of the California Coast Ranges. A recent fault study by J. H. Kleinfelder and Associates suggests this escarpment may be a wave-cut erosional feature. However, they stated there is not enough evidence to reject the previously mapped trace of the Del Norte fault. At the town of Smith River, the mountain front trends westward, forming the northern boundary of the plain, except for the narrow coastal strip that extends into Oregon.

The Smith River Plain can be divided into a bedrock series that includes all rocks of pre-Tertiary age and a sedimentary series of Tertiary to Quaternary age, which includes the principal water-bearing units. The bedrock series consists of dense crystalline rocks of the Franciscan Complex that contain no appreciable amount of ground water. This is overlain by the St. George Formation, which also contains very little ground water. Small amounts of ground water may be contained in and transmitted through joints and fractures within these two formations. The younger sedimentary deposits, in contrast, transmit water through interconnected pore spaces and may contain relatively large amounts of ground water. These sedimentary deposits can be further subdivided into five geomorphic groups, based on their mode of deposition. These groups are: (1) marine terraces, (2) river terraces, (3) floodplains, (4) sand dunes, and (5) alluvial fans. Figure 3 shows the relative positions of the various geomorphic groups as they appear on the Smith River Plain.

The marine terrace, composed of the Battery Formation, occupies most of the southern half of the plain. Since emergence of the platform, the surface of this terrace has been considerably altered by stream erosion and wind action. The most outstanding feature of this area is the series of northwesterly-trending roughly parallel, elongated sand ridges. They are about 500 feet wide at the base and rise 30 or 40 feet above the plain. The ridges are relict sand dunes that formed at the end of the Pleistocene before vegetation covered the newly emerged surface. Natural drainage is greatly impeded by these ridges. Only Elk and Jordan Creeks have succeeded in cutting channels through to the ocean and to Lake Earl, respectively. Marine terrace deposits,



Smith River Plain Geomorphic Groups

Figure 3

correlative with the Battery Formation, also occupy the narrow bench forming the northern extension of the plain north of the mouth of Smith River.

River terrace deposits were formed during the Pleistocene when the ancestral Smith River and Rowdy Creek dumped floodplain and stream-channel deposits onto the plain from Fort Dick to the town of Smith River. Subsequent elevation of the plain and renewed downcutting of streams left these deposits with irregular terrace edges. The largest terrace, the Fort Dick terrace, borders the southern margin of the Smith River floodplain. The boundary between this terrace and the floodplain is marked by an abrupt escarpment as high as 20 feet in places. Similar but smaller terraces occur north of Smith River and along Rowdy Creek.

The Smith River has the most extensive floodplain in the area. The floodplain is about half a mile wide east of Fort Dick and widens gradually toward the west for about 4 miles, where it merges with the floodplain of Rowdy Creek near the mouth of Smith River. The floodplain has a relatively flat and featureless southward extension to Lake Earl along Talawa Slough. Elsewhere, these deposits have irregular low swales containing standing water during part of the year.

Recent sand dunes form a narrow strip about one mile wide from Point St. George to the mouth of Smith River. These dunes, on the lee side of the beach, form elongated ridges as much as 60 feet high with the long axis oriented roughly northwest. Some of the dunes are active and are migrating to the south, while others have been stabilized by vegetation. The sand dunes are a barrier to surface runoff from the central part of the plain, resulting in the formation of lake Earl and Lake Talawa.

Alluvial fans form the smallest geomorphic unit within the Smith River Plain. The fans form a narrow, discontinuous apron of alluvial debris along the base of the escarpment bounding the plain's eastern edge. The fans are marked by a small change in slope at their base that gradually steepens toward the base of the mountain front. They tend to fan out from the mouths of the many small drainages or coalesce to form a larger fan.

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HYDROGEOLOGY

This section provides background material on the principles of hydrogeology and describes the aquifers and occurrence and movement of ground water in the Smith River Plain.

The occurrence, movement, and fluctuations of ground water are determined through analysis of water-level data from wells throughout a ground water basin. The best data can be obtained only from qualified wells (wells with logs and information on the placement of perforations in the casing), which are perforated in a single stratum. These data can show both seasonal and long-term changes in water levels. Historical records of water levels are helpful in detecting trends in ground water storage in a basin. Appendix C is a list of all water levels the Department has on file for the Smith River Plain.

Principles of Ground Water Hydrology

The movement of a drop of water from the time it enters the ground to the time it emerges, either naturally or by being pumped from a well, is controlled by underground conditions. Upon entering the ground, the water moves downward through the zone of aeration and into the zone of saturation, the upper surface of which is the water table. Figure 4 shows the occurrence of ground water within these zones. In the upper zone, or zone of aeration, most of the the intergranular spaces in the geologic materials are filled partly with air and partly with water, and conditions may approach saturation due to infiltration of rainfall or irrigation water. Wells cannot produce ground water from the zone of aeration. "Perched" ground water can occur in an isolated saturated zone separated from the main body of ground water by a layer of rock or clay that water cannot pass through.

In the lower zone, or zone of saturation, the intergranular spaces in the underground materials are interconnected and filled with ground water. Ground water exists in this zone under unconfined conditions, except where there are widespread impervious layers that can trap water beneath them. There is no evidence that any of the major aquifers in the Smith River Plain are confined with ground water under pressure. They all can be recharged from direct precipitation, surface runoff, or the ocean. The water table is the upper surface of the water in the saturated zone and is approximately the level to which water will rise in a well.

Ground water resources are replenished when water from precipitation, streamflow, irrigation, and other sources sinks into the ground, and the area into which it sinks is called a "recharge area". Recharge areas normally include mountains, foothill slopes, and valley floors. Alluvial deposits on valley floors that are hydrologically connected to rivers and streams are often important recharge areas. These deposits are usually very permeable and allow rapid infiltration. In coastal areas, permeable sediments in contact with sea water may permit lateral movement of salt water into a ground water basin if the water table is lowered by ground water extraction.

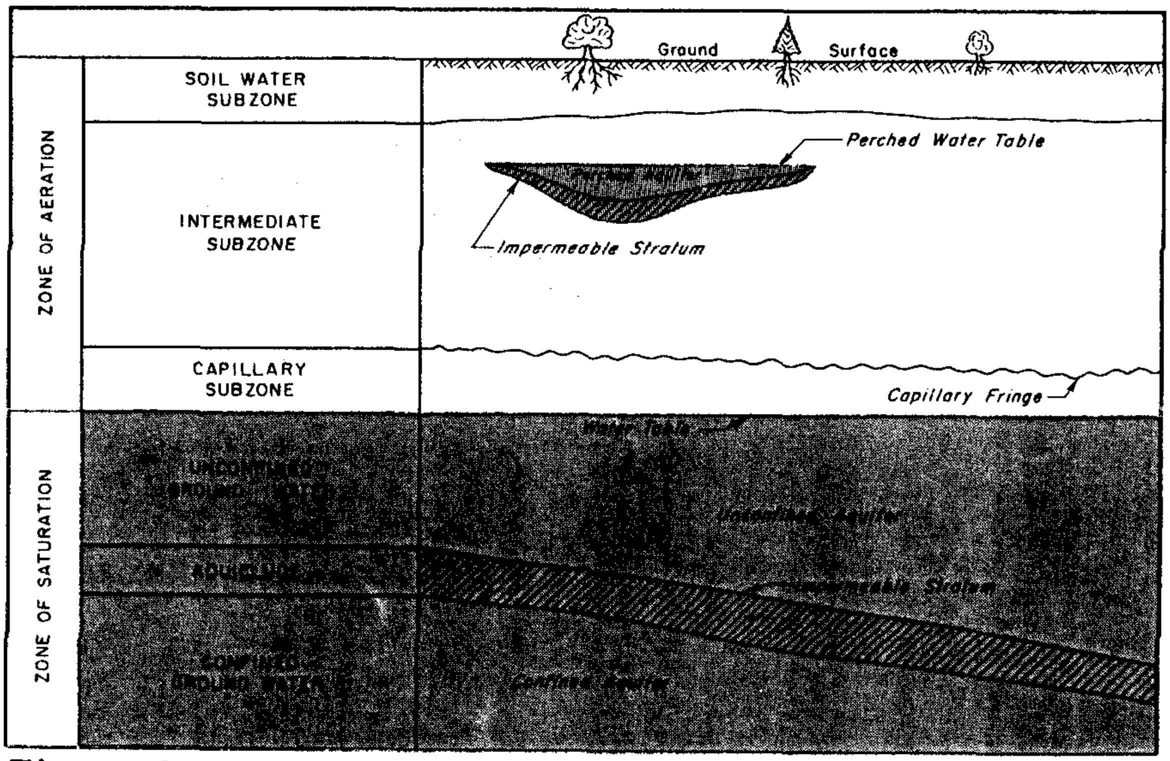


Figure 4 Occurrences of Ground Water.

Ground Water Occurrence

Most of the materials that make up the earth's outer crust have open spaces that may contain ground water. The openings range from minute pores in clays and small cracks in rocks to large passages found in some basalt flows and limestone areas. Porosity, or the percentage of empty space in a material, does not necessarily mean ground water can move through the material easily. If the openings are very small or are not connected, water movement is restricted and the material is said to have a low permeability, even though its porosity may be high. Thus materials of low permeability and high porosity, such as clay, transmit little water to wells. In contrast, materials of high permeability but somewhat lower porosity, such as mixtures of coarse gravel and sand, can yield large amounts of ground water.

Impacts of Pumping

When a well is pumped, the water level around it is drawn down to form an inverted cone with its apex at the well. This cone of depression in the static water surface is shown in Figure 5. The size of the cone depends on how much water is being pumped and how fast water can flow through the aquifer to replenish the well. As pumping continues, the cone expands in depth and area until it reaches equilibrium between pumping demand and aquifer yield.

Where the amount of water pumped from an aquifer is greater than aquifer yield, water levels will continue to decline. In areas where intensive development has taken place in ground water reservoirs, the cone of depression of some wells will overlap with those of neighboring wells, producing a regional area of depression and lowering water levels. Figure 6 illustrates the effects of this interference among pumping wells. The extent of interference depends on the rate of pumping from each well, the spacing between wells, and the hydraulic characteristics of the aquifer into which the wells are drilled.

Ground Water Movement

General ground water movement in a ground water basin can be interpreted from maps that show lines of equal elevation of the static water table. The maps indicate the direction of ground water movement, at right angles to the contour lines, and water moves from the higher elevation contour to the lower, or from areas of recharge to areas of discharge. Under typical water table conditions, the slope of the water table and, therefore, the direction of ground water movement are closely related to the slope of the land surface. Under natural conditions, the rate of ground water movement in an aquifer is usually slow, from a few feet to a few hundred feet per year. However, pumping can create a temporary depression in the water table and change the direction and rate at which ground water moves--toward the well instead of down the natural gradient.

Often, physical barriers that impede the movement of ground water are indicated by the patterns or spacings of the ground water contours. The effect of geologic faults on the movement of ground water can often be interpreted from contour maps. Where a fault offsets a water-bearing layer, ground water may be dammed, forming a higher water table on the recharge side, or may rise along the fault zone and appear at the ground surface as springs.

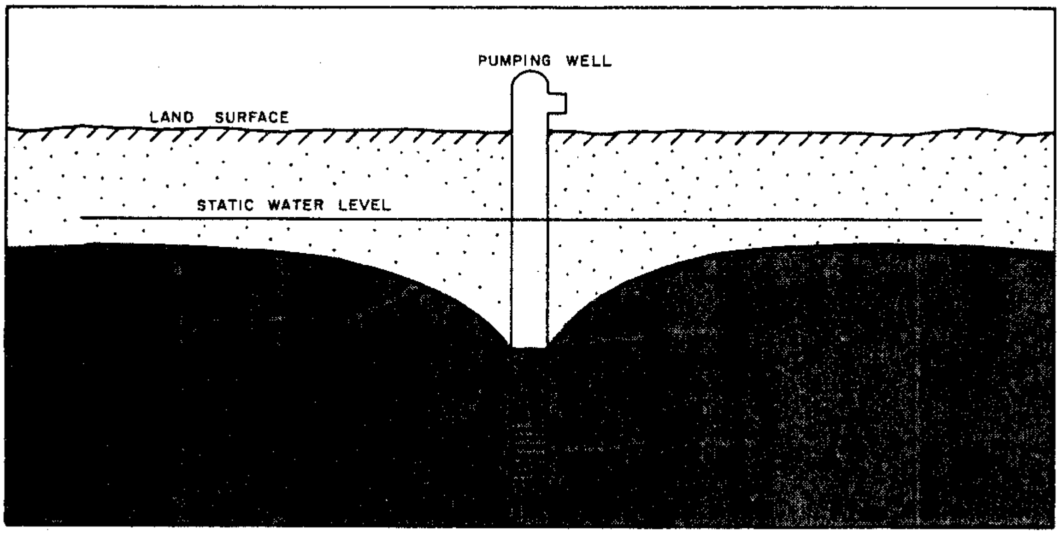


Figure 5 Cone of depression caused by pumping wells.

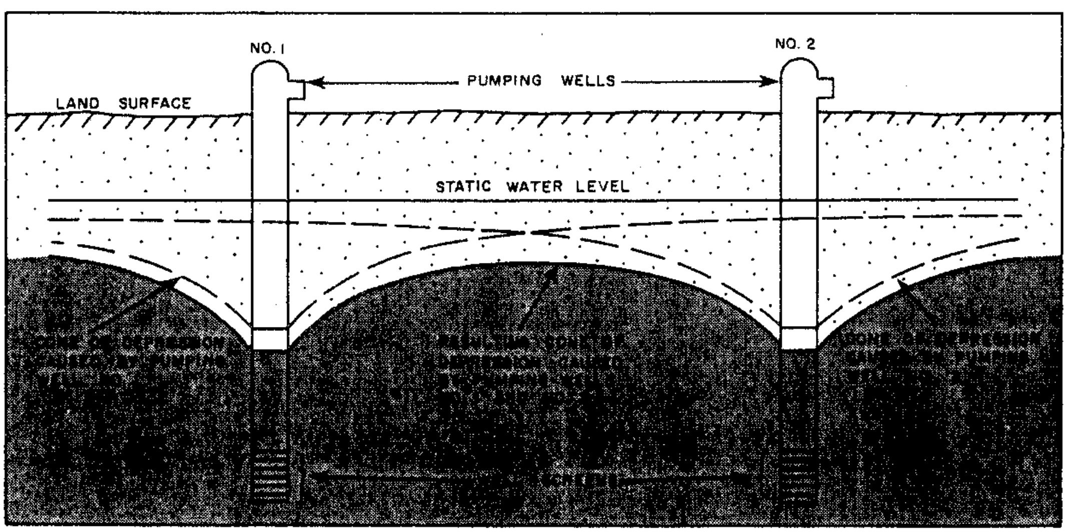


Figure 6 Effects of interference between two pumping wells.

Non-Water-Bearing Formations

Within the Smith River Plain ground water basin, there are two rock units, the bedrock series and the St. George Formation, where only minor amounts of ground water occur.

Bedrock Series

The Jurassic to Cretaceous age Franciscan Complex rocks form the "basement" of the Smith River Plain platform and the adjacent Northern Coast Ranges. They consist of marine sedimentary rocks including sandstone, shale, and minor amounts of chert, conglomerate, and greenstone. In general, the basement rocks are slightly metamorphosed, poorly bedded, and complexly deformed. These rocks weather rapidly and develop thick, clayey, residual soils on the upland slopes.

The bedrock series underlies the plain south of Lake Earl at depths of up to 300 feet beneath the surface (USGS, 1957). North of Lake Earl, bedrock usually occurs at depths of less than 100 feet. Scattered rock outcrops, which are interpreted as ancient sea stacks, protrude through the younger sediments.

The basement rocks are essentially impermeable; however, small amounts of water are transmitted and contained locally in joints and fractures. These openings give rise to many small springs along the front of the Coast Range. A 215-foot-deep well at Redwood Union School drilled into bedrock reportedly yields 5 gallons per minute (gpm) with a drawdown of 150 feet. Several wells that penetrate basement rocks near the range front have reportedly been unproductive. In general, the rocks transmitted only small amounts of ground water along joints and fractures. Consequently, depth to water, hydraulic gradients, and recharge and discharge features are extremely erratic.

Where the bedrock series is exposed at the ground surface, ground water may occur in open joints and fractures where little filtering action takes place. Under such conditions, there is often danger of contamination from surface sources.

St. George Formation

Massive, poorly-indurated, marine siltstone and shale with irregular thin beds of sand are exposed in the sea cliff beneath the Battery Formation between Point St. George and Crescent City (see Photo 1). The sedimentary deposits of the St. George Formation indicate deposition in a bay or lagoon during Pliocene time. Seismic evidence and boring logs from the recent prison site investigations at Malarkey Forest and Story Ranch suggest the formation may be buried under younger deposits beneath a large portion of the south half of Smith River Plain. At very low tides, the St. George is exposed at the extreme south end of the plain. A thickness of about 45 feet is exposed in the sea cliff near the county airport, and a maximum formational thickness of 400 feet has been estimated (USGS, 1957). Beds of the St. George Formation strike north 50 degrees west and dip about 12 degrees northeast, indicating gentle folding before deposition of the overlying Battery Formation.

The overall permeability of the St. George Formation is very low. When ground water moving vertically through the Battery Formation encounters the St. George, it is restricted, so it moves laterally along the contact in the direction of the ground water gradient. Photo 1 shows ground water discharging at the contact along a bluff west of Crescent City. The St. George Formation does have two prominent joint sets (see Photo 2) that give the formation a high, localized secondary permeability that yields limited water to some wells.

Water-Bearing Formations

Five water-bearing, geomorphic groups were identified earlier. Each has distinct geologic units that, due to their mode of deposition, affect the occurrence and movement of ground water through the formations. These units are described below, and some of their water-bearing characteristics are summarized.

Battery Formation

The Pleistocene Battery Formation is a thin, flat-lying, marine terrace deposit unconformably overlying basement rocks or the St. George Formation (see Photo 3). A typical section consists of lenticular, poorly stratified beds of silty sand alternating with thin clay layers. This formation includes some contemporaneous, stream-deposited sand and gravel east of Lake Earl. Subsurface data indicate the thickness of the Battery Formation ranges from 30 to 70 feet and averages 45 feet thick. It underlies most of the plain south and east of Lake Earl and forms the narrow marine terrace north of the mouth of Smith River.

The principal aquifer south of Fort Dick, in the Crescent City area, is in the Battery Formation. The producing zones consist of lenticular beds of fine- to medium-grained, well-sorted sand. These sand beds are usually encountered at about 25 feet but may be found from 2 to 40 feet below ground surface. East of Lake Earl, the sands and gravels form a more or less continuous aquifer, extending from Fort Dick to a drainage divide between Jordan and Elk Creeks. Depth to this aquifer ranges from 5 to 30 feet and averages about 20 feet. Ground water is either perched or unconfined in these aquifers. The permeability ranges from 150 to 900 gallons per day (gpd) per square foot and is commonly about 350 to 450 gpd per square foot. The formation is moderately permeable, but has limited saturated thickness. Well yields are large enough for domestic and limited irrigation uses. However, most wells are not drilled through the total thickness of the formation and their average depth is about 30 feet. If wells were completed through the entire thickness and well screens or gravel packing used, yields should increase appreciably.

The Battery Formation is recharged by subsurface inflow from adjacent alluvial fans to the east, sand dunes to the west, and from direct infiltration of rainfall. Due to the tight clayey nature of the upper part of the Battery Formation, recharge is slow in some places.

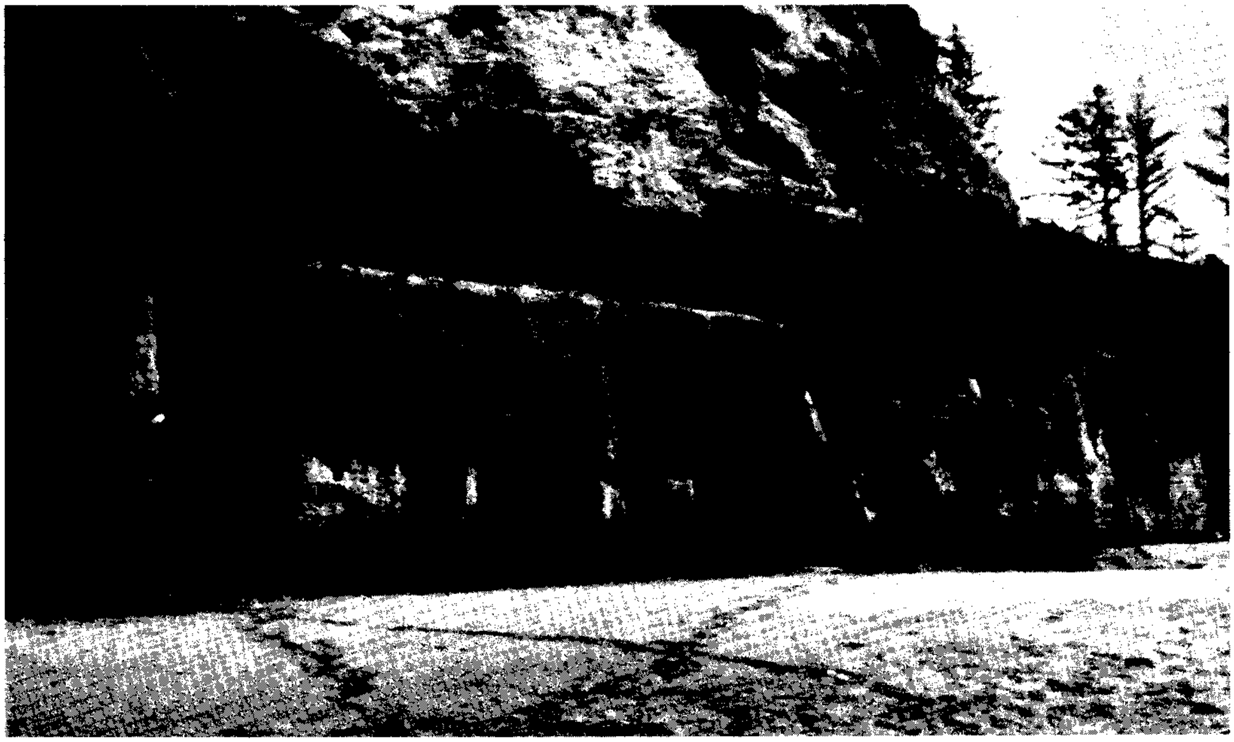


Photo 1. St. George Formation showing seepage at upper contact.

Photo 2. Joint sets in St. George Formation.

Photo 3. Battery Formation overlying St. George Formation.

River Terrace Deposits

Pleistocene deposits that form the terraces flanking Smith River and Rowdy Creek floodplains consist of silt, sand, and gravel with some clay. Generally, these deposits become coarser with depth and large boulders are often encountered at the base. Photo 4 shows the typical rock size and sorting found in these deposits. Well logs indicate the deposits range in thickness from 30 to 40 feet near Fort Dick to over 55 feet near the community of Smith River. Generally, they are underlain by basement rocks, but locally they may rest on the Battery or St. George Formations. The upper 10 to 15 feet are usually clayey due to soil development and weathering.

The river-terrace deposits serve as aquifers and as ground water recharge areas for adjacent formations. These deposits are moderate to highly permeable, with permeabilities ranging from 1,000 to 2,000 gpd per square foot. However, due to the limited saturated thickness, yields to wells are not generally high. Several irrigation wells in the Fort Dick and Rowdy Creek areas yield 140 to 400 gpm; specific capacities range from 15 to 60 gpm per foot of drawdown. Well yields sufficient for domestic needs can almost always be developed. However, some of the smaller terraces may not have enough storage to provide water through the summer months. Recharge is by direct infiltration of rainfall, subsurface inflow from alluvial fans to the east, influent seepage from streams, and infiltration of irrigation water.

Photo 4. Fort Dick river terrace deposits showing typical clast size range (hammer for scale) and sorting.

Alluvial Fan Deposits

Recent alluvial fans form a steep, nearly continuous apron less than one mile wide along the base of the mountains. These deposits consist primarily of poorly-sorted, subrounded rocks in a silty clay matrix. The occasional sand and gravel lenses represent buried stream channels. The bulk of the unit was probably derived from landslides and possibly mudflows rather than entirely from stream deposition.

Permeability of the fan deposits is generally very low, due to large amounts of interstitial clay. However, some lenses of sand and gravel have a relatively high permeability, particularly at the distal or western end of fans, where streams have had a chance to rework and remove much of the clay.

In general, yields to wells penetrating only alluvial fan deposits are relatively low but can be highly variable. Reportedly, these deposits sometimes do not yield enough water for domestic use.

Ground water moves from the fan head westward into adjacent deposits. Water levels vary primarily with topography, ranging from about 5 to 30 feet beneath the ground surface.

Dune Sand

Recent eolian, or windblown, sand deposits form dunes that cover an area along the ocean more than 10 miles long and about one mile wide, from Point St. George to the mouth of Smith River. These deposits consist of well-sorted, medium to fine sand. Finer-grained soils have developed in the interdune areas where drainage is poor. The total thickness is unknown, but the sand ridges stand 60 to 70 feet above the marine terrace surface and above sea level. Therefore, the dune sand can be assumed to reach a thickness of at least 70 feet.

The dune sand is moderate to highly permeable and yields sufficient water for domestic and stock wells. Recharge is derived entirely from precipitation. Ground water moves away from the sand ridges and discharges eastward into Lake Earl and westward into the ocean, and a part is lost by evapotranspiration. Some water is also recharged to adjoining alluvium and the Battery Formation. In the sand dune area, depth to water in wells ranges from about 3 to 25 feet or more, depending on the elevation of the land surface. Ponds often occur in interdune areas where the water table intersects the land surface.

Floodplain Deposits

Recent floodplain deposits underlie the present floodplain of Smith River and its tributaries. These deposits rest on basement rock or Battery Formation and lap onto river terrace deposits along the edge of the floodplain.

Floodplain deposits generally consist of gravel, sand, and some silt. The sands and gravels are well-rounded and poorly sorted. Boulders and cobbles are common where the river flows out of the mountains. As the floodplain spreads out over the platform, the gravels generally become finer. Silty soils, 2 or 3 feet thick, cover the floodplain deposits except in the active channels of Smith River and Rowdy Creek. The floodplain deposits range in thickness from about 40 to 95 feet.

The floodplain deposits contain large amounts of unconfined water and are the most productive aquifers in the Smith River Plain. Consequently, most of the irrigation well development is in this area. Yields to irrigation wells range from about 200 to 800 gpm. Permeabilities range upward from 6,000 gpd per square foot and average about 10,000 gpd per square foot.

Sources of recharge to the floodplain deposits include direct infiltration of precipitation, subsurface inflow from adjacent deposits, seepage of applied irrigation water, and influent seepage of Smith River and Rowdy Creek during high flows.

Ground Water Hydrology

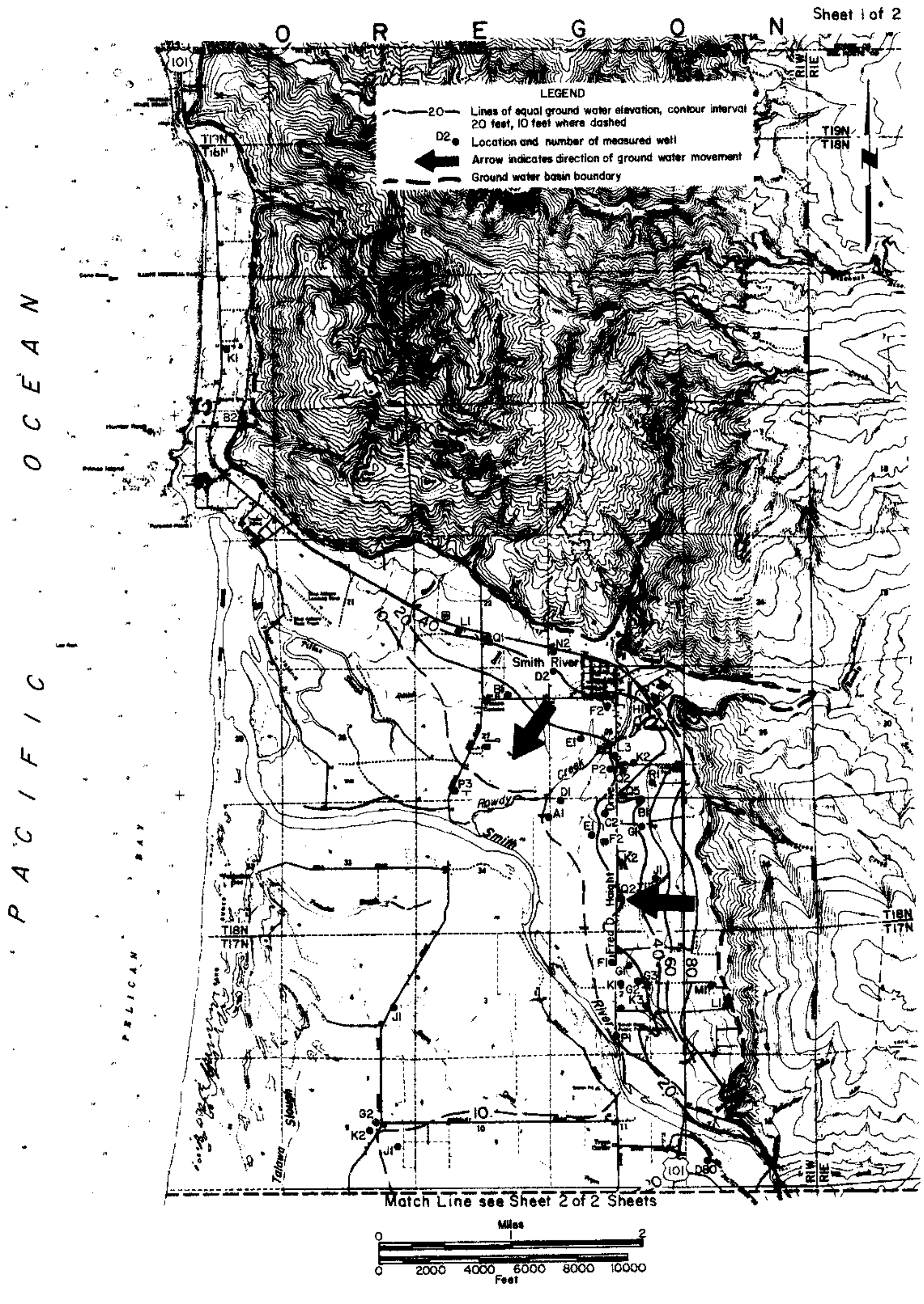
This discussion of ground water movement and fluctuation is based on water-level measurement made between July 1985 and June 1987 and four continuous water-level records. A contour map was drawn for spring 1987 using 105 well measurements.

Direction of Movement

Ground water in the Smith River Plain generally moves from east to west from the base of the hills to Lake Earl and the ocean (see Figure 7). In the northern half of the basin, the water table slopes westerly away from the mountain front with a gradient of about 85 feet per mile between U.S. 101 and Fred D. Haight Drive. On the river terrace adjacent to the Smith River, the ground water gradient is very flat. The USGS original contouring showed that from the Crescent City Ranney well to about half a mile below Dr. Fine Bridge (see Figure 2 for locations), the river gains water from the bank. Recent water-level measurements made at monitor wells near the Ranney well indicate ground water may be moving away from the river and into the south bank at the well. Below that, detailed water-level contours show the water moving back toward the river as originally contoured. Because the local gradient is so flat, the direction of movement depends on river stage and the elevation of adjacent ground water levels. About half a mile below the bridge, the river gains water from its north bank and loses water into its south bank. The shape of the 10-foot contour to the south suggests that ground water moves under low head through the swampy area to Talawa Slough and Lake Earl.

In the southern half of the basin, the gradient is about 50 feet per mile between U. S. 101 and Lower Lake Road. One mile north of Crescent City, there is a ground water divide. North of the divide, water flows toward Lake Earl; south of the divide, water either discharges by seepage along the sea cliffs west of the city or drains to the ocean along Elk Creek. Ground water movement in the basin south of Lake Earl probably closely follows the topography of the drainage patterns. Both Myers Creek northwest of the city and Elk Creek on the south receive ground water discharged from saturated sediments and drain to the ocean. Although few water-level measurements were available in this area, the ground water gradient seems to be very flat. The highest water-level elevations measured are near the airport, where rainfall infiltrates into sedimentary deposits overlying bedrock at a shallow depth. Ground water moves away from this area in all directions.

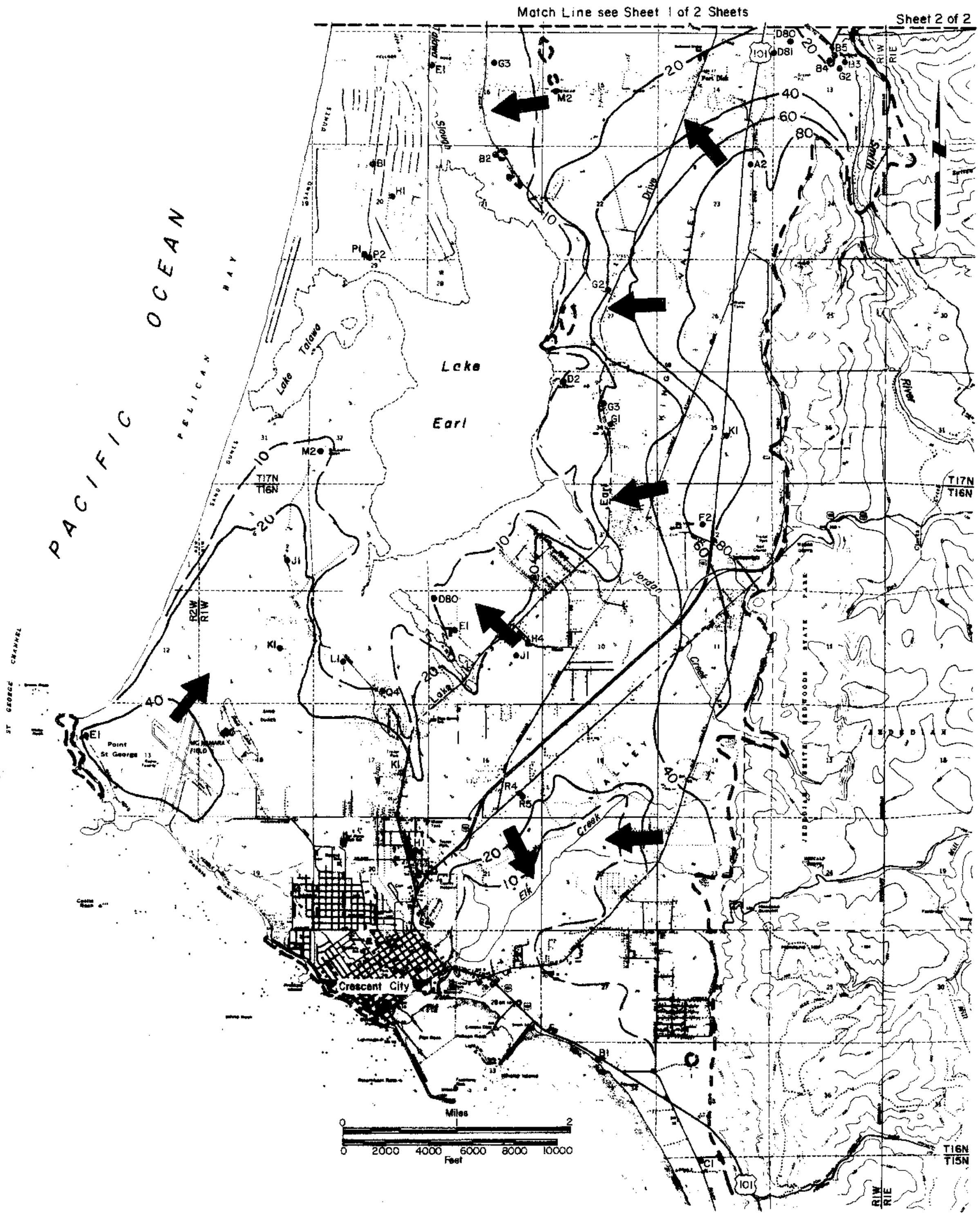
Figure 8 shows how ground water moves through a generalized geologic cross-section of the Battery Formation, St. George Formation, and the Bedrock series. Surficial deposits overlying these units include floodplain deposits, sand dunes, and alluvium, and the soils developed from them. These permeable sediments receive recharge from rainfall, irrigation, and subsurface infiltration. Ground water moves vertically and down gradient under the force of gravity to discharge areas. There may be localized areas where impermeable strata restrict downward movement and create perched or ponded water. This may cause seeps at the ground surface, and water levels in wells will stand above the free water table (see Well B).



STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
NORTHERN DISTRICT

Elevation of Water in Wells
Spring 1987
Smith River Plain

Figure 7


Match Line see Sheet 1 of 2 Sheets
Sheet 2 of 2
PACIFIC OCEAN
PELICAN BAY
Lake Earl
Lake Talawa
Crescent City
Point St George
Jordan Creek
Elk Creek
T17N
T16N
T15N
R2W
R1W
R1E
Miles
0
1
2
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2000
4000
6000
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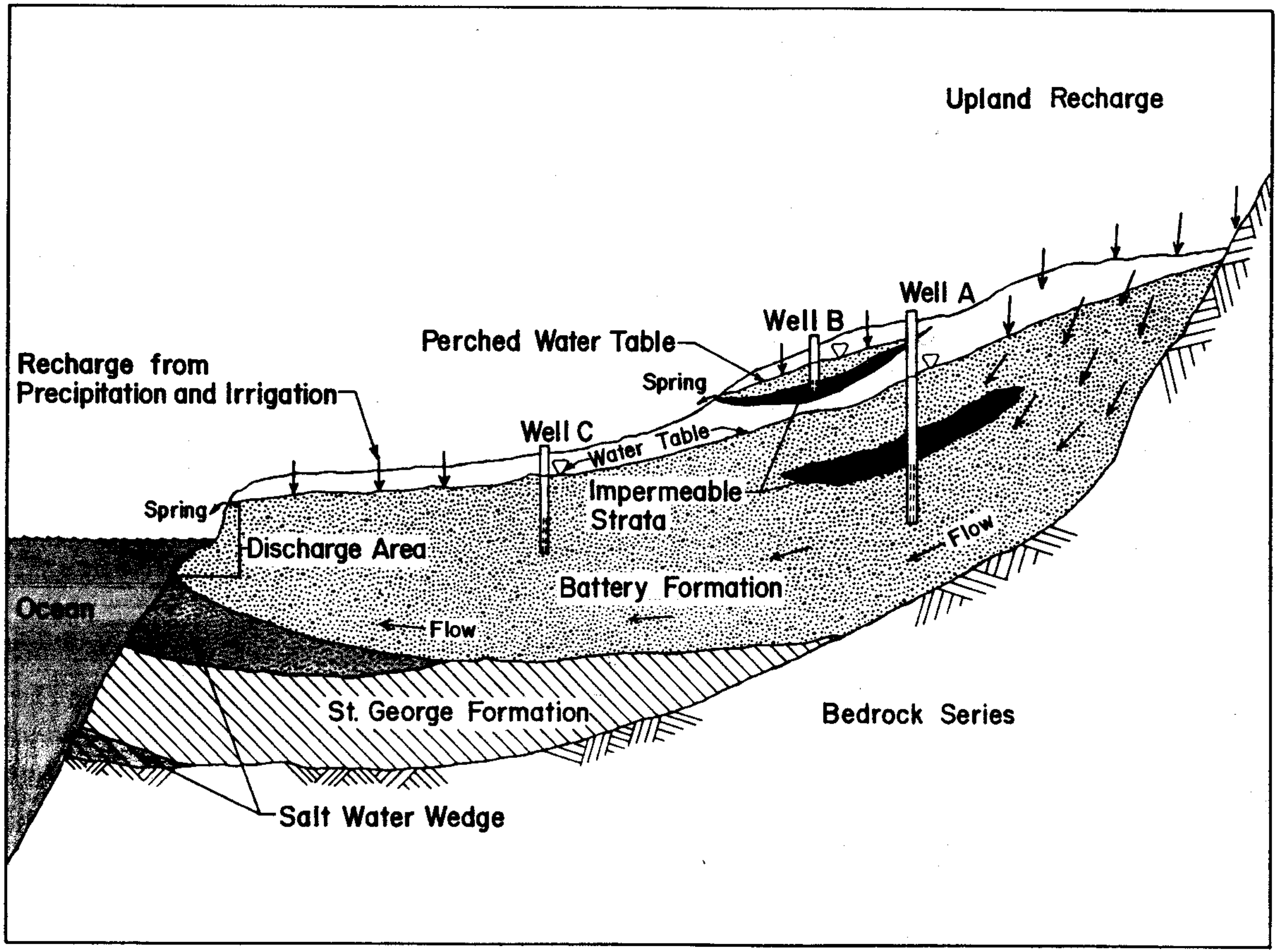
10000
Feet



Generalized Geologic Cross Section of the Smith River Plain

Figure 8

In the Smith River Plain, some ground water is lost through evapotranspiration by plants. However, discharge is primarily to springs and seeps that drain into the ocean or to streams that drain into Lake Earl and Talawa. At the coastline, it is possible that salt water can move inland underneath the freshwater aquifers. The westward-sloping ground water gradient, high precipitation, and abundant ground water discharge provide a favorable hydraulic pressure against this intrusion. South and west of Crescent City, sea water cannot enter the permeable sediments because they rest on St. George Formation or the Bedrock series at or above sea level. Although there is no evidence that sea water has intruded into the basin, joints and fractures in the St. George Formation and Bedrock series may contain saline water to a limited extent.

Ground Water Fluctuations

The Department has made semiannual measurements at some wells in the basin since 1953. The hydrograph records of two of these wells are shown in Figure 9 for 1967 to the present. Well 16N/1W-17K1 is 40 feet deep and probably taps free ground water in the Battery Formation. The record shows that the water level varies from about 22 feet below ground surface in the fall to 10 to 15 feet below ground surface in the spring. The spring measurement varies according to the precipitation near the time of measurement. The anomalously low water-level measurement in the spring of 1977 coincides with below-normal rainfall that year. Although the spring water level was below average in 1977, the record shows nearly 12 feet of water-level recovery at this well by spring of 1978.

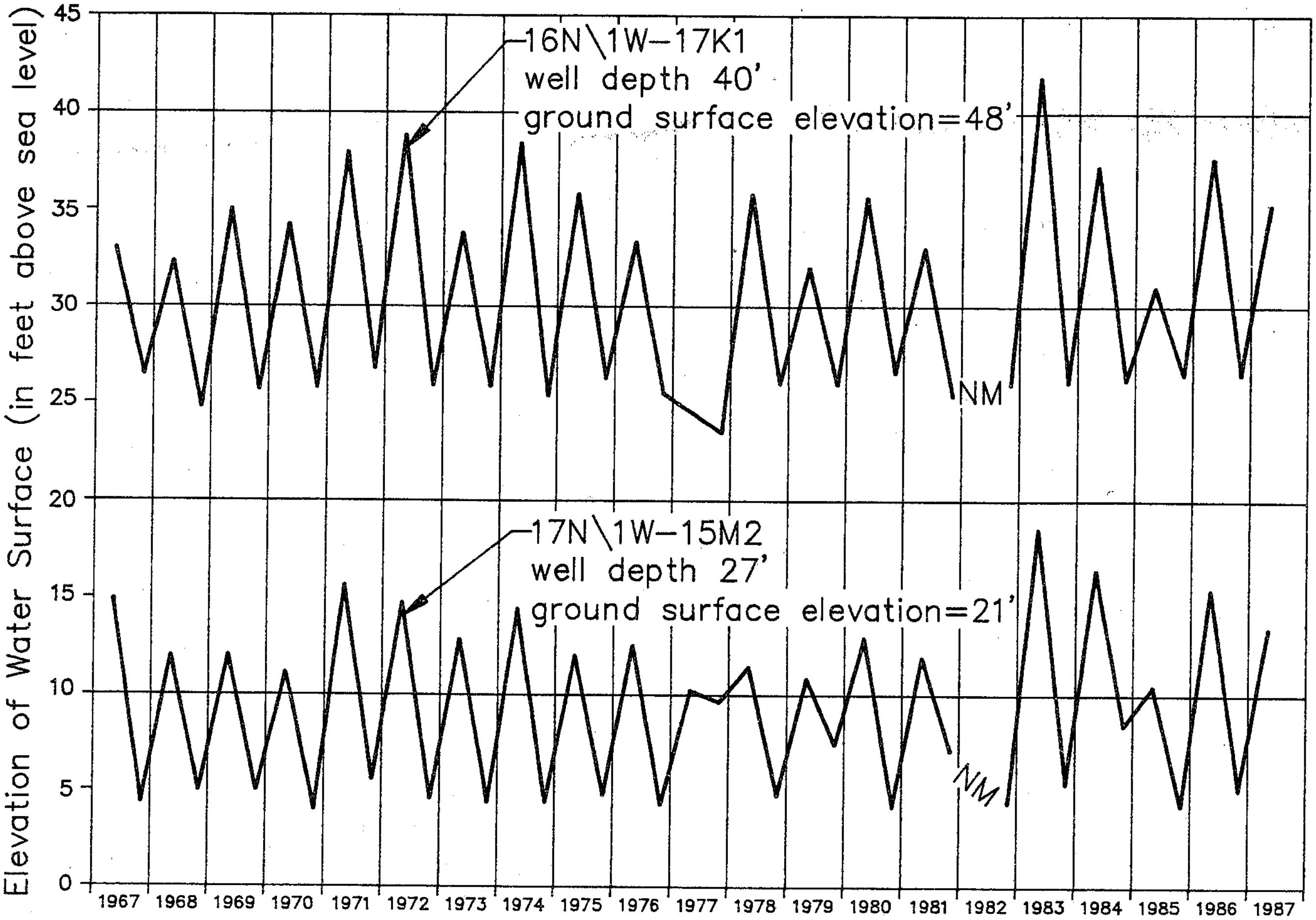
Well 17N/1W-15M2 is 27 feet deep and taps free ground water in the Smith River terrace deposit. The record for this well shows about 7 feet of annual water level fluctuation compared to about 10 feet of annual change at well 16N/1W-17K1. This probably results from the stabilizing influence of Smith River seepage on the ground water north of Lake Earl.

Figure 10 shows hydrographs of two wells near the town of Smith River. The graphs were made from continuous water-level recorder data collected during 1985-86. These records show that ground water levels change by as much as 5 to 8 feet during intense rainstorms lasting 2 to 3 days. At well 17N/1W-26Q2, the water table begins to rise the same day the storm began. Ground water decline or discharge after the storm is also quite fast. At well 17N/1W-26D4, ground water recharge begins rapidly. After the storm, the discharge is slower than at the first well. Both records, however, indicate the geologic material is highly permeable in these two areas, and ground water moves through it rapidly.

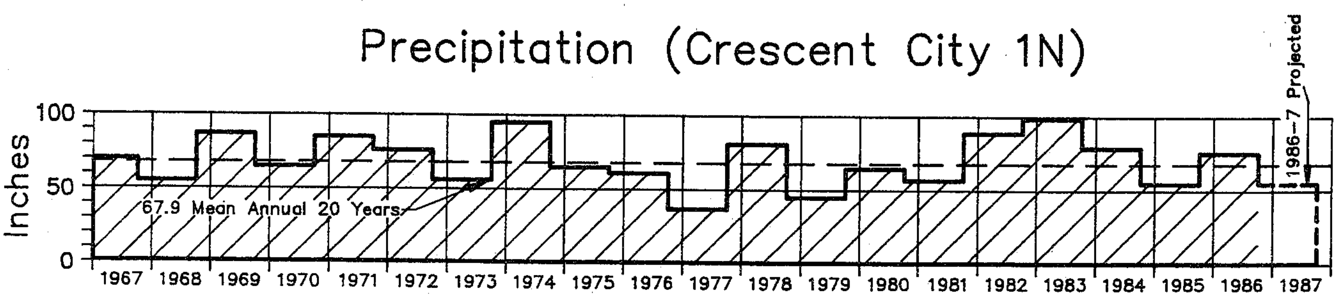
These records indicate that the most reliable water-level measurement of the Smith River Plain's overall condition is the fall measurement. In other basins, ground water pumpage makes the fall measurement highly variable. In the Smith River Plain, rainstorms cause rapid changes in the water table during the winter and spring. Rapid ground water movement probably equalizes local pumping depressions so that fall water-level measurements reflect the static water table better than spring measurements.

Figure 9

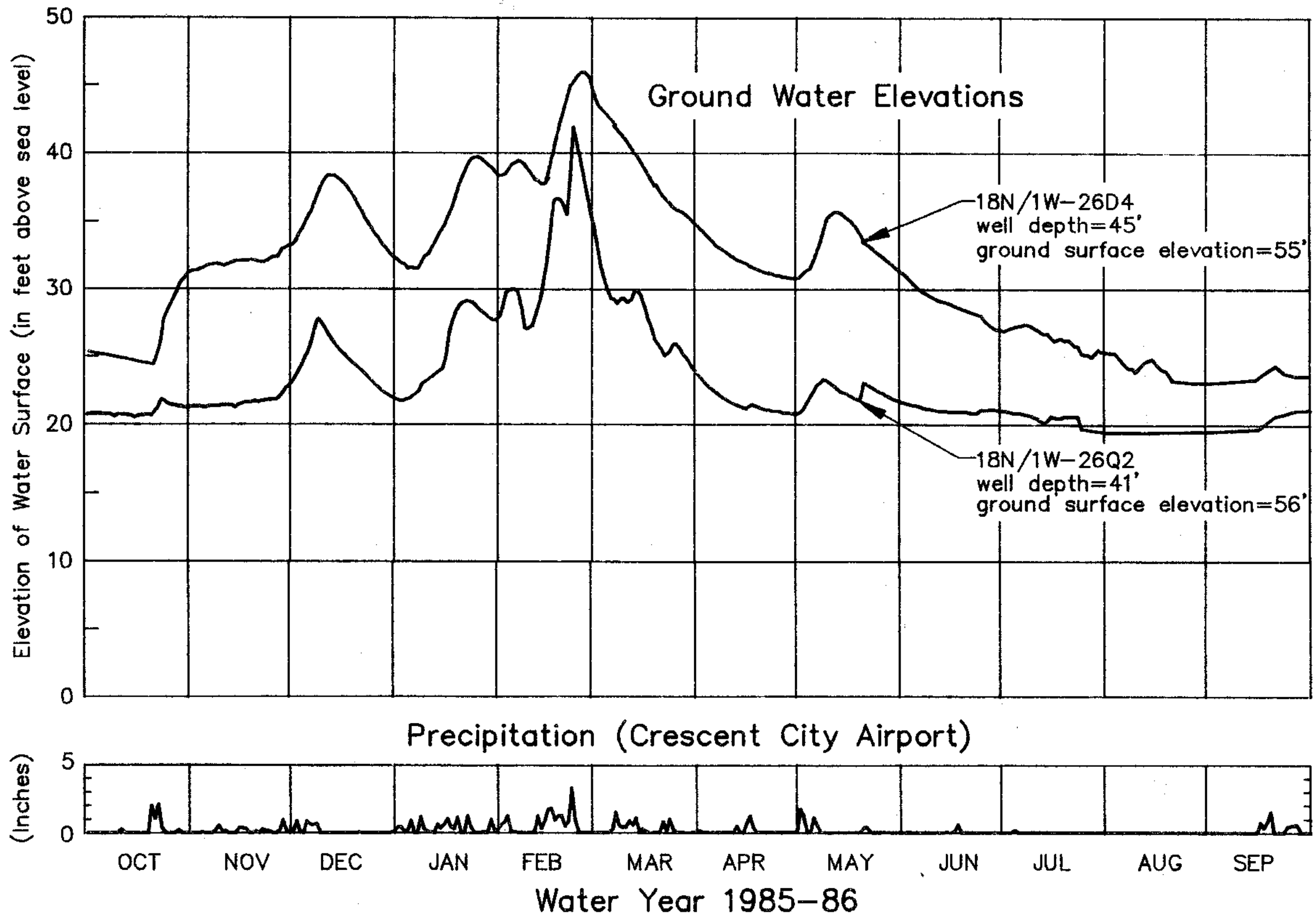
Ground Water Elevations



Precipitation (Crescent City 1N)



Smith River Plain Hydrographs, 1967–1987



Smith River Plain Hydrographs, 1985-1986

Figure 10

Preliminary data from the water level recorders near Lake Earl suggest that ground water is discharging to the lake from all around its perimeter. During May, after the Lake Earl/Talawa spit closed off, the lake level rose 0.1 foot per day. During that same period, the water level at well 17N/1W-34D1, about 600 feet from the lake, dropped 0.1 foot per day. All the other well recorders near the lake showed the same trend, discharging ground water as the lake level rose.

Ground Water Use

The storage capacity of the Smith River Plain Ground Water Basin is nearly 100,000 acre-feet (USGS, 1957). The estimated ground water use in 1985 (see Table 1 below) was about 13 percent of the storage capacity of the basin. Of this amount, 9,700 acre-feet were used for irrigation, 3,300 acre-feet were used for municipal and industrial purposes. The irrigation use may vary from year to year due to changing economic conditions and rainfall. The monthly municipal demand varies up to 40 percent due to the seasonal influx of tourists and the operation of the fisheries processing plants. A large impact on water use will be the new State prison, which will create an estimated additional demand of 1,000 acre-feet from the municipal system (D. Gustafson, pers. comm.).

Table 1. Estimated 1985 Water Use (DWR, 1987)

	Acre-feet	
Annual change in storage		+21,700
Agricultural use	9,700	
Municipal/industrial use	3,300	
Total annual pumpage		-13,000
Minimum natural discharge		-8,700

Between April and October, when there is very little recharge to the ground water basin from precipitation and an unknown amount of recharge from subsurface inflow, the average lowering of the ground water level is about 7 feet. This change in water level corresponds to 21,700 acre-feet* of water. If 21,700 acre-feet represents the minimum annual change in storage, then the

* Calculated using an average specific yield of 10 percent and a basin area of 31,000 acres.

basin must be discharging at least 8,700 acre-feet during the summer months. During the winter, the discharge is much higher. These figures show that there is huge surplus of unused ground water available in the basin for present and projected future water needs.

There are, however, two problems that will limit use of ground water in the basin. One problem is that well yields vary depending upon the local geology and hydrology. As discussed in previous sections, there are few locations where well yields exceed 500 gpm. This will limit the ground water use for irrigation, municipal, and industrical use in some places due to the low yields. The other problem is changes in the ground water quality.

Even though there is sufficient quantity of ground water for future use, degradation of this resource can limit its beneficial uses. The ground water in the Smith River Plain is unconfined, which means it is also unprotected from surface contaminants. In areas where the percolation rates are high, transport of contaminants into the ground water can be rapid. In areas where the percolation rates are low, a high water table may exist. Poor drainage in these areas can lead to septic system failures and leakage of poor quality surface water into domestic wells. Both of these situations (rapid percolation and high water table) restrict the effectiveness of the natural filtration in the unsaturated zone above the free ground water table.

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WATER QUALITY

Water acts as a solvent on minerals and soils as it passes over the earth's surface and underground. The amount and kinds of suspended or dissolved constituents reflect the many elements present in the environment of the hydrological cycle. The addition of these constituents may have a significant effect on the chemical behavior of the water and change its value for beneficial use.

Most of the dissolved mineral constituents in water are in the form of ions. The most common positively charged ions (cations) are calcium, magnesium, sodium, and potassium. The negatively charged ions (anions) include carbonate, bicarbonate, sulphate, chloride, and nitrate.

The mineral character or type of water is based on the predominant cation and anion, as indicated in chemical equivalent per million (epm). The name of the cation is used when its chemical equivalents constitute 50 percent or more of the total cations. Similarly, this applies to the anion group. For example, a magnesium bicarbonate character water is one in which the magnesium cation and bicarbonate anion each constitute half or more of the individual totals of cations and anions. Where no single constituent exceeds 50 percent, hyphenated combinations are used. An example is a magnesium-calcium bicarbonate water.

This section presents the water quality criteria, ground water quality, and a discussion of ground water quality problems in the Smith River Plain. Mineral analyses of ground water samples collected from wells in Del Norte County are listed in Appendix D. Minor element analyses are included in Appendix E. Appendix F contains water quality guidelines for agriculture water use.

Water Quality Criteria

As the two major beneficial uses of ground water in this basin are domestic and agriculture, water quality criteria for each were used to evaluate its quality. Sanitary surveys and bacteriological sampling were beyond the scope of this investigation and water quality evaluations were based solely on chemical and physical characteristics. Except for the constituents that are considered toxic to humans, the concentrations included in the criteria should be considered as suggested limiting values. A water that contains constituent concentrations exceeding these values need not be eliminated from consideration as a source of supply, but should be used with caution and other sources of better quality water should be investigated.

Domestic and Municipal Water Supply

The criteria used in this report for evaluating ground water for domestic use are those included in the State of California domestic water regulations for chemical and physical quality.

Water containing contaminants exceeding the maximum contaminant levels shown in Tables 2, 3, and 4 presents a risk to the health of humans when continually used for drinking or culinary purposes.

Table 2. Maximum Contaminant Levels - Inorganic Chemicals

Constituents	Maximum Contaminant Level, mg/L
Arsenic	0.05
Barium	1
Cadmium	0.01
Chromium	0.05
Lead	0.05
Mercury	0.002
Nitrate (as NO_3)	45
Selenium	0.01
Silver	0.05

Table 3. Maximum Contaminant Levels - Selected Organic Chemicals

Constituents	Maximum Contaminant Level, mg/L
(a) Chlorinated hydrocarbons	
Endrin	0.0002
Lindane	0.004
Methoxychlor	0.1
Toxaphene	0.005
(b) Chlorophenoxys	
2,4-D	0.1
2,4,5-TP Silvex	0.01

Table 4. Limiting Concentrations for Fluoride

Annual Average of Maximum Daily Air Temperature		Fluoride Concentration, mg/L			
Degrees Fahrenheit	Degrees Celsius	Lower	Optimum	Upper	Maximum Contaminant Level
53.7 and below	12.0 and below	0.9	1.2	1.7	2.4
53.8 to 58.3	12.1 to 14.6	0.8	1.1	1.5	2.2
58.4 to 63.8	14.7 to 17.6	0.8	1.0	1.3	2.0
63.9 to 70.6	17.7 to 21.4	0.7	0.9	1.2	1.8
70.7 to 79.2	21.5 to 26.2	0.7	0.8	1.0	1.6
79.3 to 90.5	26.3 to 32.5	0.6	0.7	0.8	1.4

Water containing substances exceeding the maximum contaminant levels shown in Tables 5 and 6 may be objectionable to an appreciable number of people, but is not generally hazardous to health.

Table 5. Consumer Acceptance Limits – Secondary Drinking Water Standards

Constituents	Maximum Contaminant Levels
Color	15 units
Copper	1.0 mg/L
Corrosivity	Relatively low
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor – threshold	3 units
Foaming agents (MBAS)	0.5 mg/L
Turbidity	5 units
Zinc	5.0 mg/L

Table 6. Mineralization – Secondary Drinking Water Standards

Constituent, Units	Maximum Contaminant Levels		
	Recommended	Upper	Short Term
Total dissolved solids, mg/L	500	1,000	1,500
or			
Specific conductance, micromhos	900	1,600	2,200
Chloride, mg/L	250	500	600
Sulfate, mg/L	250	500	600

Agriculture Water Supply

Prior to 1974, the Department of Water Resources used water quality criteria for the suitability of water for irrigation, which had been developed by the University of California, and classified waters into three groups: Class I (excellent to good), Class II (good to injurious), and Class III (injurious to unsatisfactory). As these criteria were used, it became apparent that they were too general and not applicable in some instances.

To provide improved criteria, a University of California Committee of Consultants formulated a group of guidelines for the interpretation of agricultural water quality in the early 1970s. These 1970 guidelines have been used by the Department of Water Resources since that time and were used during this investigation. These guidelines are summarized in Table 7 and the complete guidelines are presented in Appendix F. The interpretation of these guidelines is based on the possible effects the constituents may have on crops and/or soils. Guidelines are flexible and should be modified when warranted by local experience or special conditions of crop, soil, and method of irrigation.

Table 7. Agricultural Water Supply Criteria

Problems and Related Constituent	Water Quality Guidelines: No Problem	Increasing Problems	Severe Problems
Salinity[1/]			
EC_w of irrigation water, in millimhos/cm	<0.75	0.75-3.0	>3.0
Permeability			
EC_w of irrigation water, in mmho/cm	>0.5	<0.5	<0.2
adj.SAR[2/]	<6.0	6.0-9.0	>9.0
Specific Ion Toxicity[3/]			
from ROOT absorption			
Sodium (evaluate by adj.SAR)	<3	3.0-9.0	>9.0
Chloride (me/L)	<4	4.0-10	>10
(mg/L or ppm)	<142	142-355	>355
Boron (mg/L or ppm)	<0.5	0.5-2.0	2.0-10.0
from FOLIAR absorption[4/] (sprinklers)			
Sodium (me/L)	<3.0	>3.0	--
(mg/L or ppm)	<69	>69	--
Chloride (me/L)	<3.0	>3.0	--
(mg/L or ppm)	<106	>106	--
Miscellaneous[5/]			
NH_4-N mg/L or No_3-N ppm for sensitive crops	<5	5-30	>30
HCO_3(me/L)	<1.5	1.5-8.5	>8.5
(mg/L or ppm) (only with overhead sprinklers)	<90	90-520	>520
pH	normal range = 6.5-8.4		--

1/ Assumes water for crop plus leaching requirement will be applied. Crops vary in tolerance to salinity. (mmho/cmX640 = approximate total dissolved solids (TDS) in mg/L or ppm; mmhoX1000 = micromhos).

2/ adj.SAR (Adjusted Sodium Adsorption Ratio) is calculated from a modified equation developed by U. S. Salinity Laboratory to include added effects of precipitation or dissolution of calcium in soils and related to $CO_3 + HCO_3$ concentrations.

To evaluate sodium (permeability) hazard:

$$\frac{Na}{\sqrt{\frac{Ca + Mg}{2}}} \quad 1 + (8.4\ pHc)$$

pHc is a calculated value based on total cations. Ca + Mg, and $CO_3 + HCO_3$. Calculating and reporting will be done by reporting laboratory.
NOTE: NA, CA+MG, CO_3+HCO_3 should be in me/L.

Permeability problems, related to low LC or high adj.SAR of water, can be reduced if necessary by adding gypsum. Usual application rate per acre-foot of applied water is from 200 to about 1,000 lbs. (234 lbs of 100% gypsum added to 1 acre-foot of water will supply 1 me/L of calcium and raise the EC_w about 0.1 mmho.) In many cases a soil application may be needed.

3/ Most tree crops and woody ornamentals are sensitive to sodium and chloride. Most annual crops are not sensitive. For boron sensitivity, refer to boron tolerance tables.

4/ Leaf areas wet by sprinklers (rotating heads) may show a leaf burn due to sodium or chloride absorption under low humidity, high-evaporation conditions. (Evaporation increases ion concentration in water films on leaves between rotations of sprinkler heads.)

5/ Excess N may affect production or quality of certain crops, e.g. sugar beets, citrus, avocados, apricots, grapes, etc.
(1 mg/L NO_3-N = 2.72 lbs, N/acre-foot of applied water.) HCO_3 with overhead and sprinkler irrigation may cause a white carbonate deposit to form on fruit and leaves.

Symbol	Name	Symbol	Name	Equiv. Wt.
EC_w	Electrical Conductivity of water	Na	Sodium	23.00
mmho/cm	millimho per centimeter	Ca	Calcium	20.04
<	less than	Mg	Magnesium	12.16
>	more than	CO_3	Carbonate	30.00
mg/L	milligrams per liter	HCO_3	Bicarbonate	61.00
ppm	parts per million	NO -N	Nitrate-nitrogen	14.00
LR	Leaching Requirement	Cl	Chloride	35.45
me/L	milliequivalents per liter			
TDS	Total Dissolved Solids		17.1 ppm = 1 grain per gallon	

Water Quality Characteristics

To determine the present quality of Smith River Plain ground water, 32 wells were sampled in the summer of 1986 (Figure 2, page 5). Temperature, pH, and EC measurements were made at the time of sampling and 29 of the samples were analyzed for standard mineral content at the Department's chemical laboratory at Bryte. In addition, 22 partial mineral analyses were supplied by the RWQCB. Wells that have historic partial and standard water quality are available from the Department of Water Resources' storage and retrieval system. These well analyses were included so that present quality could be evaluated in relation to historical variation. All of these data have been included in appendices in the back of this report.

Smith River Plain ground waters are generally of good mineral quality with total dissolved solids (TDS) contents ranging from about 50 to nearly 500 milligrams per litre (mg/L). The median level of TDS concentration is 100 mg/L. Electrical conductivity (EC) of 120 well waters ranged from 57 to 746 micromhos per centimetre (umhos/cm) at 25 degrees C. with a median of 153 umhos/cm. The highest EC level of 746 umhos/cm came from well 17N-01W-20P2, just north of Lake Talawa. This is an 18-foot shallow well producing a magnesium-calcium bicarbonate water.

A comparison of historic and recent EC records showed no discernible trend of change in the basin. Of the 21 wells having long-term water quality records, 19 had records that showed only minor changes in EC. The other two wells showed a general decrease in EC.

Smith River Plain ground waters are magnesium bicarbonate throughout most of the basin. To the south, near Crescent City, the water becomes sodium bicarbonate in character, and four wells that tap the St. George Formation contain water of sodium chloride character (see Appendix B). Two of these are drilled into St. George Formation, and the perforations are near the bottom. Both wells are in the Elk Creek drainage in the southern portion of the basin. The third well is completed in Battery Formation. However, water from this well is above the bedrock series near Point St. George. Electrical conductivity and dissolved solids data show that some of the deeper wells in the Kings Valley area, which are perforated near the bottom, are slightly higher in dissolved mineral content than the typical magnesium-bicarbonate water found in the Battery Formation. The concentrations of total dissolved solids, however, do not exceed recommended limits for drinking water.

Alkalinity and pH

Alkalinity levels in Smith River Plain ground waters, when expressed as calcium carbonate, ranged from 7 to 237 mg/L with a median concentration of 50 mg/L. Measurements of pH ranged from 5.7 to 7.3 with a median value of 6.7. Since a pH level of 7.0 is neutral, some of the waters with the lower pH's can be expected to be very corrosive.

Chlorides

Chloride levels in Smith River Plain ground waters are usually very low. Chloride concentrations in 120 ground water wells varied from 5 to 77 mg/L, with a median value of only 10 mg/L.

Sulfates

Sulfate levels in Smith River Plain ground waters are also low. In 120 ground water sources, concentrations ranged from 0 to 31 mg/L with a median value of 4 mg/L.

Hardness

Total hardness in the Smith River Plain ranges from 14 to 256 mg/L (expressed as calcium carbonate) with a median of 60 mg/L. Most of these waters are considered soft; however, three wells north of Lake Earl produce waters with hardness exceeding 200 mg/L and are considered very hard.

Sodium Adsorption Ratio

The Adjusted Sodium Adsorption Ratio (ASAR) is a useful factor in evaluating the hazard related to changes in soil permeability and resultant salt buildup caused by high concentrations of sodium in irrigation water. Levels above 3 can cause increasing problems, and levels greater than 9 can cause severe problems. ASAR values for 64 ground water sources in the Smith River Plain range from 0 to 2 and have a median of 1. This reflects the low sodium in the ground water throughout the basin.

Boron

Boron appears to pose no problems in Smith River Plain ground water. The boron concentrations in 78 ground waters range from 0.0 to 0.1 mg/L with a median concentration of 0.0 mg/L.

Nitrate

Nitrate (NO_3) levels in the ground waters of the Smith River Plain are generally low. Isolated incidences of high NO_3 have occurred, but do not appear to be related. Data from 119 ground water sources showed NO_3 levels from 0 to 66 mg/L with a median value of 7 mg/L. Most of the high NO_3 monitored was found near the town of Smith River, where 12 wells exceeded 30 mg/L as NO_3. Four of those wells exceeded the recommended limit of 45 mg/L as NO_3 for drinking water.

Suitability for Beneficial Use

The beneficial use of Smith River Plain ground water is limited locally by pesticide residue and nitrate levels that exceed the recommended limits for domestic use. The pesticide contamination is from two compounds, aldicarb and 1.2 dichloropropane, that are used to control nematodes in lily bulbs. Ground water containing these pesticide residues have been found in wells near the town of Smith River. Sampling and testing by the RWQCB shows that the aldicarb levels in these wells have been decreasing since that compound was banned in 1983. There is no recognizable trend for the concentration of the other compound.

The highest nitrate levels in the basins ground water have been found near the town of Smith River. They may be the result of poor well sealing and local aquifer contamination from septic systems, agricultural fertilizers, and/or dairy wastes. These high levels are of concern because of the relationship between high nitrates in drinking water and infant methemoglobinemia. Under certain circumstances, nitrate can be reduced in the gastrointestinal tract to nitrite, which then reaches the bloodstream and reacts directly with hemoglobin to produce methemoglobin, with consequent impairment of oxygen transport.

The reaction of nitrite with hemoglobin can be hazardous in infants under three months of age. Serious and occasionally fatal poisonings in infants have occurred following ingestion of untreated well waters shown to contain nitrate at concentrations greater than 45 mg/L. High nitrate concentrations frequently are found in shallow farm and rural community wells, often as the result of inadequate protection from barnyard drainage or from septic tanks.

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SUMMARY OF FINDINGS

1. The Smith River Plain Ground Water Basin was formed by the emergence of a shallow submarine platform. The main aquifers occur in marine terraces, river terraces, floodplain and alluvial deposits, and sand dunes.

2. Ground water aquifers in the Plain are unconfined and free hydrologic interchange occurs among adjacent geologic units.

3. The Battery Formation contains the major aquifers tapped by domestic wells. The floodplain aquifers have the highest yield and supply the majority of irrigation wells in the basin.

4. Ground water movement is generally from east to west from the base of the hills to Lake Earl and the ocean. In some places, the gradient is so flat that the direction of ground water movement depends on local river and lake height, and recent precipitation.

5. Continuous water level records show that in some places ground water levels respond rapidly to precipitation throughout the year. In other places, a high water table indicates slow percolation rates may limit ground water movement.

6. Ground water will remain one of the most important sources of water supply for the Smith River Plain. Only about 13 percent of the basin's estimated 100,000 acre-feet of storage capacity is currently being used. The remaining ground water is either in storage or moving through the basin.

7. Smith River Plain ground waters are generally of good mineral quality with total dissolved solids contents ranging from about 50 to nearly 500 milligrams per litre (mg/L). The median level is 100 mg/L. This water meets the mineral water quality requirements for municipal and domestic uses and is of good quality for irrigation purposes.

8. A limited area of ground water near the town of Smith River is contaminated with pesticides and has higher than recommended nitrates. These water quality problems will be discussed in a separate report to be published in 1988 by the RWQCB.

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CONCLUSIONS

1. The expanded and updated water quality sampling grid presented in Figure 2 (page 5) should be implemented to annually monitor the basin's mineral quality.

2. The expanded and updated water-level measurement grid for this study (Figure 2) should also be implemented. It is adequate to contour the ground water elevation in the basin. Annual water-level change can be found by measuring these wells twice a year. Recent precipitation must be considered when evaluating the spring measurement.

3. Heavy precipitation, numerous streams, and the Smith River provide an abundance of good quality water for annual recharge of the ground water basin. The resulting mineral quality of ground water in the Smith River Plain is generally excellent and is suitable for most beneficial uses.

4. Ground water occurs in and moves through unconfined aquifers at shallow depths. These two factors threaten ground water quality by limiting the natural filtration that normally occurs as recharge waters move through the ground. Discharge of wastes and use of toxic materials need to be carefully controlled if pollution is to be prevented.

5. There is localized ground water impairment in the basin in the Smith River area, where some wells are contaminated with pesticides. This pesticide problem will be the subject of a future report by the RWQCB.

6. There is also localized ground water impairment from nitrate in the Smith River area, which needs to be monitored.

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RECOMMENDATIONS

1. The Del Norte County Department of Public Works should continue monitoring ground water levels for the next year with the eight continuous water-level recorders installed by the Department of Water Resources around Lake Earl. The water level should be monitored and surface water samples should be taken monthly at Lakes Earl and Talawa and tested for EC, pH, and temperature. A standard mineral analysis should be run at seasonal high and low EC values.

2. The continuous recorder near the Crescent City Ranney well should be maintained on a biweekly basis in order to get detailed information on ground water movement. This recorder will also provide historic water-level data to analyze the impact of additional pumpage at the Ranney well if that system is expanded to accommodate the Del Norte County Prison.

3. The County should enforce well-sealing standards. This is especially critical in areas where toxic materials are used. The practice of storing chemical pesticides in or near well pump houses should be ended immediately.

4. The County should canvass domestic wells for nitrate and total and fecal coliform bacteria in the Smith River area. New well construction and property exchanges involving domestic water wells should include a water analysis for nitrate.

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Appendix A
Well Numbering System

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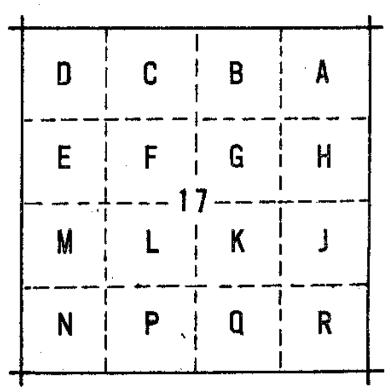
APPENDIX A

WELL NUMBERING SYSTEM

During this study, current water level and ground water quality data were combined with historic data to get a better understanding of the present ground water quality and detect changes that may have occurred. The wells used in this study have been qualified as to what formation they draw water from. This qualification, the well construction, and general water chemistry are presented in Appendix B. Current and historic water levels and water quality data have been included in Appendices C, D, and E. Appendix F contains the agricultural water quality guidelines used in this report. Each well has been numbered according to the California State Well Numbering System, and data in the appendices are listed by that number. All data have also been entered in the Department of Water Resources' data storage and retrieval system (WDIS) so that they are available for dissemination and updating.

The well numbering system uses the township, range, and section subdivisions of the Public Land Survey as its base. Each section is then divided into sixteen 40-acre tracts, lettered as follows:



16N/3E - 17K1H

Wells are numbered within each 40-acre tract according to the chronological sequence in which they have been assigned California State well numbers. For example, a well which has the number 16N/3E-17K1H would be in Township 16 North, Range 3 East, Section 17. K1 further designates it as the first well assigned a State well number in Tract K. The location of the wells used in this study are shown in Figure 2.

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Appendix B
Well Qualification and Water Character

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WELL NUMBER	NUM	DEPTH	YIELD	QUALIFICATION	FORMATION	CONSTRUCTION	QUALITY
16N\01W- 2J1	0000	36		FREE-DEFINITE	ALLUV FAN	PERF CASING 22\34	WL ONLY
16N/01W- 2Q3		30		FREE-PROBABLE	BATTERY		Ca-MgHCO3
16N/01W- 3F1	140619	32	20?	FREE-DEFINITE	BATTERY	PERF CASING 24\32	MgHCO3
16N/01W- 3N8		36		FREE-PROBABLE	BATTERY		MgHCO3+NO3
16N/01W- 8Q4		24		FREE-PROBABLE	BATTERY		MgHCO3/NaC
16N/01W- 8Q5	13738	35	20?	FREE-DEFINITE	BATTERY	GRVPK,PERFD 30\35	NaHCO3+NO3
16N/01W- 9H4	140634	40	20?	FREE-DEFINITE	BATTERY	GRVPK,PERFD 35\40	MgHCO3
16N/01W- 14M2	132269	35	20?	FREE-DEFINITE	ST GEORGE	GRVPK,PERFD 30\35	NaCl
16N/01W- 15F2	113165	35	15?	FREE-DEFINITE	BATTERY	GRVPK,PERFD 30\35	MgHCO3
16N/01W- 17K1		40		FREE-PROBABLE	BATTERY		WL ONLY
16N/01W- 17K4	112859	40	18?	FREE-DEFINITE	BATTERY	GRVPK,PERFD 35\40	MgHCO3+CL
16N/01W- 20H1		31		FREE-PROBABLE	BATTERY		MgHCO3/NaC
16N/01W- 20Q2	42626	40	18	FREE-DEFINITE	BATTERY	PERF CASING 32\40	MgHCO3
16N/01W- 21F1	1006	35	15	FREE-DEFINITE	ST GEORGE	PERF CASING 30\33	NaCl
16N/01W- 22J4	139788	38	6	FREE-PROBABLE	BATTERY	GRVPK,PERFD 33\38	Na-MgHCO3
16N/01W- 26M9	113152	36	15?	FREE-DEFINITE	BATTERY	PERF CASING 31\36	MgHCO3/NaC
16N/01W- 34B1	132290	30	10	FREE-DEFINITE	ST GEORGE	PERF CASING 25\36	NaHCO3
16N/02W- 13E1		30		FREE-PROBABLE	BATTERY	HAND DUG	NaCl
17N/01W- 2G1		50		FREE-PROBABLE	RIVER TER	CASED TO BOT	MgHCO3+NO3
17N/01W- 2P1		27		FREE-PROBABLE	RIVER TER		WL ONLY
17N/01W- 3E1		25		FREE-PROBABLE	RIVER TER		WL ONLY
17N/01W- 4J1		35		FREE-POSSIBLE	RIVER TER		MgHCO3
17N/01W- 4L3	45705	32		FREE-DEFINITE	RIVER TER	PERF CASING 22\32	MgHCO3
17N/01W- 9G1				FREE-PROBABLE	BATTERY		MgHCO3
17N/01W- 9K2		17		FREE-PROBABLE	BATTERY	HAND DUG	MgHCO3
17N/01W- 14C2	1551	40		FREE-DEFINITE	RIVER TER	PERF CASING 32\40	MgHCO3
17N/01W- 14K4	132268	47	15?	FREE-DEFINITE	BATTERY	PERF CASING 42\47	MgHCO3
17N/01W- 14R2	113167	50	15?	FREE-DEFINITE	BATTERY	PERF CASING 45\50	MgHCO3
17N/01W- 15M2		30		FREE-PROBABLE	RIVER TER		WL ONLY
17N/01W- 16F1	139761	23	40?	FREE-DEFINITE	BATTERY	PERF CASING 14\23	MgHCO3
17N/01W- 20H1	13721	30	20?	FREE-DEFINITE	SND DUNES	PERF CASING 25\30	Ca-MgHCO3
17N/01W- 20P1		?		FREE-PROBABLE	SND DUNES	UNKNOWN	WQ-CaHCO3
17N/01W- 20P2		18		FREE-PROBABLE	SND DUNES	HAND DUG	WL-MgHCO3
17N/01W- 22E6	113189	40	15	FREE-DEFINITE	BATTERY	PERF CASING 35\40	MgHCO3
17N/01W- 27G2	13730	40	20?	FREE-DEFINITE	BATTERY	PERF CASING 32\40	MgHCO3
17N/01W- 27Q5		25		FREE-PROBABLE	BATTERY	HAND DUG	WL ONLY
17N/01W- 34G3	13707	30	20	FREE-DEFINITE	BATTERY	PERF CASING 22\36	MgHCO3
17N/01W- 35K1	29961	33	20	FREE-DEFINITE	BATTERY	PERF CASING 12\28?	MgHCO3
							MgHCO3
18N/01W- 5K1	120125	56		FREE-DEFINITE	MARINE TER	PERF CASING 44\56	Ca-MgHCO3/
18N/01W- 27P3		25		FREE-PROBABLE	RIVER TER		WL ONLY
18N/01W- 34M2		27		FREE-PROBABLE	RIVER TER		MgHCO3
18N/01W- 35B1/2	140	55		FREE-DEFINITE	BATTERY	PERF CASING	WL-NaClHCO

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Appendix C
Ground Water Level Measurements

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GROUND WATER LEVELS MEASURMENT WELL-MASTER RECORDS DATE 04/29/86 PAGE 1

DATA MGR	AREAL CODE	STATE WELL NUMBER	DATE OF RECORD	WELL DEPTH	COUNTY	REF PT ELEV	GROUND ELEV	LATITUDE	LONGITUDE	AGENCY	AQUIFER
5	F-10.00	05N/01E-20Q01 H	06/07/51		12	22.0	22.0			5000	
5	F-10.00	06N/01E-07M01 H	09/25/73		12	12.0	11.0			5050	
5	F-10.00	06N/01E-17D01 H	10/27/59		12	23.4	23.0			5001	
5	F-10.00	06N/01E-19Q01 H	09/30/70		12	21.0	19.0			5050	
5	F-10.00	06N/01E-29P01 H	11/09/65		12	27.0	25.0			5000	
5	F-10.00	06N/01E-30N01 H	06/07/51		12	13.4	12.0			5000	
5	F-07.A0	10N/01E-04:01 H	03/31/82	36	12	22.0	21.0			5050	
5	F-07.A0	11N/01E-02R01 H	09/21/78	53	12	171.0	170.0			5050	
5	F-07.A0	11N/01E-33R04 H	03/08/79	48	12	37.0	32.0			5050	
5	F-05.A1	13N/01E-15R01 H	04/09/79	200	08	51.0	50.0			5050	
5	F-11.A1	02N/01W-08B01 H	09/30/70		12	34.0	34.0			5050	
5	F-11.A1	03N/01W-18D01 H	10/15/69		12	16.0	15.0			5050	
5	1-10.00	03N/01W-26R01 H	06/08/51		12	12.0	12.0			5000	
5	F-11.A1	03N/01W-30N01 H	09/25/73		12	19.0	15.0			5050	
5	F-11.A1	03N/01W-34J01 H	10/15/69		12	54.0	53.0			5050	
5	F-11.A1	03N/02W-13J01 H	09/25/73		12	10.5	10.0			5050	
5	F-11.A1	03N/02W-26R01 H	11/09/65		12	12.0	12.0			5000	
5	F-11.A1	03N/02W-35M02 H	09/25/73		12	14.0	13.0			5050	
5	F-10.00	04N/01W-16H01 H	05/02/78	210	12	11.0	10.0			5050	
5	F-08.A0	09N/01W-24C01 H	09/21/78	40	12	106.0	105.0			5050	
5	F-03.A1	16N/01W-02J01 H	07/06/53	36	08	127.0	127.0			5050	
5	F-03.A1	16N/01W-17K01 H	07/06/53	40	08	49.0	48.0			5050	
5	F-03.A1	17N/01W-02P01 H	05/28/52	27	08	31.0	31.0			5050	
5	F-03.A1	17N/01W-03E01 H	07/08/53	25	08	14.3	14.0			5050	
5	F-03.A1	17N/01W-15N02 H	07/25/53	27	08	21.4	21.0			5050	
5	F-03.A1	17N/01W-20Q01 H	04/10/73	28	08	16.0	15.0			5050	
5	F-03.A1	17N/01W-27Q05 H	04/10/73	25	08	42.5	40.0			5050	
5	F-03.A1	18N/01W-27P03 H	04/10/73	24	08	16.5	15.0			5050	
5	F-03.A1	18N/01W-35B02 H	11/28/56	55	08	91.0	90.0			5050	
5	A-07.A0	13N/01E-11A01 M	07/01/51	145	06	32.8	31.8			5050	
5	A-07.A0	13N/01E-32Q01 M	03/28/67	76	06	26.0	23.0			5050	
5	A-07.A0	14N/01E-21L01 M	09/31/70		06	37.5	37.0			5050	
5	A-07.D0	17N/01E-01R01 M	03/10/52	126	04	70.0	69.5			5106	
5	A-07.D0	17N/01E-03A01 M	02/05/47	220	04	64.2	63.2			5001	
5	A-07.D0	17N/01E-10A01 M	03/10/53	110	04	63.0	63.0			5106	
5	A-07.D0	17N/02E-06D01 M	08/12/64	25	04	71.5	71.0			5050	
5	A-07.D0	17N/02E-08D01 M	12/13/29	24	04	76.0	74.5			5001	
5	A-07.C0	17N/02E-12A01 M	11/26/29	103	04	89.2	90.0			5001	
5	A-07.C0	17N/02E-14A01 M	04/07/47	102	04	79.5	82.5			5001	
5	A-07.C0	17N/02E-16C01 M	08/22/47	95	04	75.0	74.0			5001	
5	A-08.D0	17N/03E-01R01 M	07/31/53		04	100.5	100.0			5001	
5	A-08.D0	17N/03E-03D01 M	04/10/47	179	04	97.0	95.0			5106	
5	A-07.C0	17N/03E-05C01 M	04/10/47	137	04	96.0	96.0			5106	
5	A-07.C0	17N/03E-08G01 M	03/12/53	140	04	90.3	90.0			5106	
5	A-08.D0	17N/03E-13N01 M	01/21/76	420	04	86.0	85.0			5050	
5	A-08.D0	17N/03E-14H01 M	03/01/67		04	92.5	92.0			5106	
5	A-07.C0	17N/03E-16N01 M	03/12/53	178	04	85.5	85.0			5106	
5	A-08.D0	17N/04E-05C01 M	05/02/61		04	95.2	95.0			5106	
5	A-08.D0	17N/04E-08A01 M	05/02/61	290	04	96.0	96.0			5106	
5	A-08.D0	17N/04E-08L01 M	05/02/61	270	04	92.2	92.0			5106	
5	A-08.D0	17N/04E-16E01 M	11/27/29	175	04	106.0	106.0			5000	

F NORTH COAST HB
F-03 SMITH RIVER HU
F-03.A LOWER SMITH RIVER HA
F-03.A1 SMITH RIVER PLAIN HSA

STATE WELL NUMBER	CO	GROUND SURFACE ELEVATION	DATE	GROUND TO WATER	WATER SURFACE ELEV.	AGENCY
16N/01W-02J01 H		127.0	07/06/53	16.7	110.3	5000
			07/30/53	18.3	108.7	
			09/20/53	19.3	107.7	
			02/14/54	14.7	112.3	
			11/17/58	12.0	115.0	
			12/18/58	16.1	110.9	
			01/20/59	15.1	111.9	
			02/18/59	14.6	112.4	
			03/18/59	16.0	111.0	
			04/22/59	16.3	110.7	
			05/19/59	16.8	110.2	
			06/23/59	18.0	109.0	
			07/21/59	20.1	106.9	
			08/25/59	22.8	104.2	
			09/23/59	20.2	106.8	
			10/28/59	18.1	108.9	
			11/18/59	18.4	108.6	
			12/16/59	18.1	108.9	
			01/27/60	16.0	111.0	
			02/17/60	15.3	111.7	
			03/30/60	14.7	112.3	
			04/26/60	14.9	112.1	
			05/24/60	14.9	112.1	
			06/21/60	18.4	108.6	
			07/20/60	18.1	108.9	
			08/23/60	19.6	107.4	
			09/20/60	19.7	107.3	
			10/25/60	19.2	107.8	
			11/15/60	18.0	109.0	
			01/24/61	15.8	111.2	
			02/21/61	13.9	113.1	
			03/28/61	14.6	112.4	
			04/27/61	14.0	113.0	
			05/16/61	14.8	112.2	
			06/27/61	21.0	106.0	
			07/27/61	20.1	106.9	
			08/29/61	19.2	107.8	
			09/28/61	20.1	106.9	
			10/24/61	19.4	107.6	
			11/28/61	16.1	110.9	
			12/27/61	15.4	111.6	
			01/24/62	15.2	111.8	
			02/27/62	15.1	111.9	
			03/27/62	14.5	112.5	
			04/26/62	15.8	111.2	
			05/24/62	15.6	111.4	
			06/26/62	18.5	108.5	
16N/01W-02J01 H		127.0	07/25/62	19.1	107.9	5000
			08/22/62	19.9	107.1	
			09/20/62	20.0	107.0	
			10/24/62	19.3	107.7	
			11/27/62	14.6	112.4	
			12/18/62	14.2	112.8	
			01/22/63	15.9	111.1	
			02/19/63	14.5	112.5	
			03/20/63	14.8	112.2	
			04/24/63	13.8	113.2	
			05/21/63	14.8	112.2	
			06/19/63	17.9	109.1	
			07/11/63	18.5	108.5	
			08/20/63	20.0	107.0	
			09/19/63	20.2	106.8	
			10/24/63	18.6	108.4	
			11/21/63	15.2	111.8	
			12/17/63	16.0	111.0	
			01/16/64	15.0	112.0	
			02/26/64	15.6	111.4	
			03/18/64	15.2	111.8	
			04/15/64	16.6	110.4	
			05/13/64	17.0	110.0	
			06/17/64	17.6	109.4	
			07/15/64	18.4	108.6	
			08/20/64	19.0	108.0	
			09/16/64	20.6	106.4	
			10/14/64	20.3	106.7	
			11/18/64	17.9	109.1	
			01/17/65	NM-9		
			02/17/65	15.7	111.3	
			03/17/65	16.9	110.1	
			04/15/65	16.3	110.7	
			05/19/65	17.4	109.6	
			06/16/65	21.4	105.6	
			07/14/65	24.2	102.8	
			08/14/65	23.1	103.9	
			09/24/65	21.7	105.3	
			10/27/65	20.6	106.4	
			11/09/65	20.6	106.4	
			01/20/66	16.1	110.9	
			02/16/66	15.9	111.1	
			03/28/66	15.6	111.4	
			10/04/66	23.4	103.6	5050
			04/12/67	18.7	108.3	
			10/04/67	25.4	101.6	
			04/10/68	17.0	110.0	

60

F NORTH COAST HB
F-03 SMITH RIVER HU
F-03.A LOWER SMITH RIVER HA
F-03.A1 SMITH RIVER PLAIN HSA

STATE WELL NUMBER	CO	GROUND SURFACE ELEVATION	DATE	GROUND TO WATER	WATER SURFACE ELEV.	AGENCY
16N/01W-02J01 H		127.0	10/17/68	21.2	105.8	5050
			04/08/69	16.5	110.5	
			10/04/69	21.1	105.9	
			04/08/70	18.5	108.5	
			10/14/70	26.3	100.7	
			12/28/70	17.7	109.3	5000
			04/14/71	16.5	110.5	5050
			10/13/71	20.0	107.0	
			04/04/72	15.9	111.1	
			10/11/72	22.2	104.8	
			04/10/73	16.9	110.1	
			09/24/73	DRY		
			04/17/74	16.8	110.2	
			11/10/74	28.0	99.0	
			04/28/75	17.2	109.8	
			10/13/75	24.7	102.3	
			04/08/76	16.5	110.5	
			10/25/76	26.0	101.0	
			04/05/77	19.5	107.5	
			09/24/77	25.2	101.8	5000
			11/01/77	19.5	107.5	5050
			04/04/78	16.8	110.2	
			11/08/78	20.2	106.8	
			04/10/79	16.5	110.5	
			11/06/79	NM-7		
			04/08/80	NM-7		
			10/01/80	NM-7		
			03/26/81	17.2	109.8	
			10/15/81	NM-0		
16N/01W-17K01 H		48.0	07/20/53	31.9	16.1	5000
			11/20/53	21.2	26.8	
			05/31/54	16.2	31.8	
			08/20/54	19.5	28.5	
			06/01/55	14.2	33.8	5001
			08/25/55	19.0	29.0	
			04/26/56	13.3	34.7	
			10/15/56	14.8	33.2	
			04/19/57	11.0	37.0	
			10/23/57	21.4	26.6	
			04/14/58	7.5	40.5	
			10/15/58	21.0	27.0	5000
			11/18/58	21.7	26.3	
			12/17/58	21.9	26.1	
			01/20/59	16.0	32.0	
			02/18/59	10.4	37.6	
			03/18/59	11.9	36.1	

F NORTH COAST HB
F-03 SMITH RIVER HU
F-03.A LOWER SMITH RIVER HA
F-03.A1 SMITH RIVER PLAIN HSA

STATE WELL NUMBER	CO	GROUND SURFACE ELEVATION	DATE	GROUND TO WATER	WATER SURFACE ELEV.	AGENCY
16N/01W-17K01 H		48.0	04/14/59	11.4	36.6	5001
			04/22/59	13.2	34.8	5000
			05/19/59	15.5	32.5	
			06/23/59	17.2	30.8	
			07/21/59	19.1	28.9	
			08/25/59	21.0	27.0	
			09/23/59	22.0(1)	26.0	
			10/28/59	22.9	25.1	
			11/18/59	23.3	24.7	
			12/14/59	22.8	25.2	
			01/27/60	24.0	24.0	
			02/17/60	22.0	26.0	
			03/30/60	16.6	31.4	
			04/26/60	14.1	33.9	
			05/24/60	13.4	34.6	
			06/21/60	13.8	34.2	
			07/20/60	16.5	31.5	
			08/23/60	26.1(1)	21.9	
			09/20/60	19.8	28.2	
			10/25/60	21.2	26.8	
			11/15/60	21.9	26.1	
			12/28/60	18.0	30.0	
			01/24/61	18.0	30.0	
			02/21/61	10.9	37.1	
			03/28/61	7.3	40.7	
			04/27/61	11.6	36.4	
			05/16/61	11.7	36.3	
			06/27/61	22.3	25.7	
			07/27/61	17.8	30.2	
			08/29/61	19.4	28.6	
			09/28/61	19.6	28.4	
			10/24/61	21.6	26.4	
			11/28/61	20.4	27.6	
			12/26/61	19.2	28.8	
			01/24/62	28.0(1)	20.0	
			02/27/62	13.7	34.3	
			03/27/62	14.1	33.9	
			04/27/62	15.7	32.3	
			05/24/62	16.9	31.1	
			06/26/62	18.4	29.6	
			07/25/62	19.8	28.2	
			08/22/62	20.8	27.2	
			09/20/62	28.6(1)	19.4	
			10/24/62	22.2	25.8	
			11/27/62	20.6	27.4	
			12/18/62	19.9	28.1	
			01/22/63	17.0	31.0	

F NORTH COAST HB
F-03 SMITH RIVER HU
F-03.A LOWER SMITH RIVER HA
F-03.A1 SMITH RIVER PLAIN HSA

STATE WELL NUMBER	CO	GROUND SURFACE ELEVATION	DATE	GROUND TO WATER	WATER SURFACE ELEV.	AGENCY
16N/01W-17K01 H		48.0	02/19/63	16.5	31.5	5000
			03/20/63	16.4	31.6	
			04/24/63	9.2	38.8	
			05/21/63	9.8	38.2	
			06/19/63	16.2	31.8	
			07/11/63	NM-1		
			08/20/63	18.8	29.2	
			09/19/63	20.0	28.0	
			10/24/63	21.5	26.5	
			11/21/63	19.9	28.1	
			12/17/63	17.9	30.1	
			01/16/64	16.6	31.4	
			02/26/64	13.4	34.6	
			03/18/64	13.5	34.5	
			04/15/64	15.3	32.7	
			05/13/64	17.6	30.4	
			06/17/64	18.8	29.2	
			07/15/64	19.9	28.1	
			08/20/64	21.2	26.8	
			09/16/64	21.9	26.1	
			10/14/64	22.8	25.2	
			11/18/64	23.8	24.2	
			12/16/64	22.4	25.6	
			01/17/65	NM-9		
			02/17/65	13.0	35.0	
			03/17/65	15.2	32.8	
			04/15/65	18.1	29.9	
			05/19/65	16.0	32.0	
			06/16/65	17.6	30.4	
			07/14/65	19.0	29.0	
			08/17/65	20.5	27.5	
			09/24/65	21.9	26.1	
			10/19/65	22.6	25.4	
			11/09/65	20.9	27.1	
			01/20/66	13.5	34.5	
			02/16/66	12.5	35.5	
			03/25/66	10.2	37.8	
			10/04/66	22.2	25.8	5050
			04/12/67	14.7	33.3	5000
			10/04/67	21.5	26.5	
			04/10/68	15.7	32.3	
			10/17/68	23.2	24.8	
			04/08/69	13.0	35.0	
			10/14/69	22.3	25.7	
			04/08/70	13.8	34.2	5050
			10/14/70	22.2	25.8	
			04/14/71	10.1	37.9	

F NORTH COAST HB
F-03 SMITH RIVER HU
F-03.A LOWER SMITH RIVER HA
F-03.A1 SMITH RIVER PLAIN HSA

STATE WELL NUMBER	CO	GROUND SURFACE ELEVATION	DATE	GROUND TO WATER	WATER SURFACE ELEV.	AGENCY
16N/01W-17K01 H		48.0	10/13/71	21.2	26.8	5050
			04/04/72	9.1	38.9	
			10/11/72	21.3	26.7	
			04/10/73	14.2	33.8	
			09/24/73	22.1	25.9	
			04/17/74	9.6	38.4	
			11/10/74	22.6	25.4	
			04/28/75	12.2	35.8	
			10/13/75	21.7	26.3	
			04/06/76	14.7	33.3	
			10/25/76	22.5	25.5	
			04/05/77	23.5	24.5	
			09/24/77	25.3	22.7	5000
			11/01/77	24.5	23.5	5050
			04/04/78	12.2	35.8	
			11/08/78	22.0	26.0	
			04/10/79	16.0	32.0	
			11/06/79	22.0	26.0	
			04/08/80	12.4	35.6	
			09/24/80	21.4	26.6	
			03/26/81	15.0	33.0	
			10/15/81	22.6	25.4	
			10/19/82	22.0	26.0	
			03/30/83	6.2	41.8	
			10/20/83	21.9	26.1	
			10/20/83	21.9	26.1	
			03/22/84	10.8	37.2	
			10/29/84	21.8	26.2	
			03/13/85	17.0	31.0	
17N/01W-02P01 H		31.0	05/28/52	19.2	11.8	5000
			07/03/53	18.6	12.4	
			09/19/53	21.9	9.1	
			10/15/58	23.3	7.7	
			11/18/58	17.8	13.2	
			12/18/58	19.6	11.4	
			01/20/59	16.7	14.3	
			02/18/59	11.9	19.1	
			03/18/59	17.9	13.1	
			04/22/59	18.8	12.2	
			05/19/59	20.1	10.9	
			06/23/59	21.5	9.5	
			07/21/59	22.2	8.8	
			09/23/59	22.3	8.7	
			10/28/59	22.1	8.9	
			11/18/59	22.3	8.7	
			12/16/59	21.8	9.2	

F NORTH COAST HB
F-03 SMITH RIVER HU
F-03.A LOWER SMITH RIVER HA
F-03.A1 SMITH RIVER PLAIN HSA

STATE WELL NUMBER	CO	GROUND SURFACE ELEVATION	DATE	GROUND TO WATER	WATER SURFACE ELEV.	AGENCY
17N/01W-02P01 H		31.0	01/27/60	18.3	12.7	5000
			02/17/60	16.3	14.7	
			03/30/60	11.1	19.9	
			04/26/60	17.4	13.6	
			05/24/60	15.7	15.3	
			06/21/60	19.4(1)	11.6	
			07/20/60	21.3	9.7	
			08/23/60	22.0	9.0	
			09/20/60	22.5	8.5	
			10/25/60	23.0	8.0	
			11/15/60	21.4	9.6	
			12/28/60	17.7	13.3	
			01/24/61	18.3	12.7	
			02/21/61	15.9	15.1	
			03/28/61	14.1	16.9	
			04/29/61	17.4	13.6	
			05/16/61	16.8	14.2	
			06/27/61	NM-1		
			07/27/61	20.0	11.0	
			08/29/61	22.0	9.0	
			09/28/61	22.9	8.1	
			10/26/61	23.0	8.0	
			11/28/61	14.8	16.2	
			12/27/61	16.5	14.5	
			01/24/62	18.1	12.9	
			02/27/62	17.5	13.5	
			03/27/62	14.5	16.5	
			04/26/62	19.1	11.9	
			05/24/62	19.5	11.5	
			06/26/62	21.4	9.6	
			07/25/62	22.5	8.5	
			08/22/62	21.2	9.8	
			09/20/62	22.2	8.8	
			10/24/62	21.1	9.9	
			11/27/62	13.0	18.0	
			12/18/62	14.0	17.0	
			01/22/63	19.6	11.4	
			02/19/63	15.6	15.4	
			03/20/63	18.2	12.8	
			04/24/63	16.0	15.0	
			05/21/63	17.0	14.0	
			06/19/63	19.3	11.7	
			07/11/63	20.8	10.2	
			08/20/63	22.0	9.0	
			09/19/63	21.7	9.3	
			10/24/63	20.5	10.5	
			11/21/63	15.5	15.5	

F NORTH COAST HB
F-03 SMITH RIVER HU
F-03.A LOWER SMITH RIVER HA
F-03.A1 SMITH RIVER PLAIN HSA

STATE WELL NUMBER	CO	GROUND SURFACE ELEVATION	DATE	GROUND TO WATER	WATER SURFACE ELEV.	AGENCY
17N/01W-02P01 H		31.0	12/17/63	18.4	12.6	5000
			01/16/64	16.9	14.1	
			02/26/64	17.6	13.4	
			03/18/64	16.8	14.2	
			04/15/64	18.8	12.2	
			05/13/64	20.2	10.8	
			06/17/64	21.6	9.4	
			07/15/64	22.0	9.0	
			08/20/64	22.6	8.4	
			09/16/64	NM-1		
			10/14/64	23.4	7.6	
			11/18/64	20.0	11.0	
			12/16/64	16.2	14.8	
			01/17/65	NM-9		
			02/17/65	17.3	13.7	
			03/17/65	18.8	12.2	
			04/15/65	19.6	11.4	
			05/19/65	19.5	11.5	
			06/16/65	21.4	9.6	
			07/14/65	21.8	9.2	
			08/17/65	22.6	8.4	
			09/24/65	22.4	8.6	
			10/19/65	15.2	15.8	
			11/09/65	21.4	9.6	
			01/20/66	15.8	15.2	
			02/16/66	16.5	14.5	
			03/28/66	15.9	15.1	
			10/04/66	22.2	8.8	5050
			04/12/67	12.1	18.9	
			10/04/67	22.1	8.9	
			04/10/68	18.2	12.8	
			10/17/68	21.0	10.0	
			10/06/69	20.5	10.5	
			04/08/70	18.7	12.3	
			10/14/70	22.5	8.5	
			04/16/71	15.6	15.4	
			10/13/71	21.1	9.9	
			04/04/72	16.0	15.0	
			10/11/72	20.7	10.3	
			04/10/73	16.5	14.5	
			09/24/73	19.0	12.0	
			04/17/74	16.6	14.4	
			11/10/74	21.0	10.0	
			04/28/75	16.8	14.2	
			10/13/75	21.5	9.5	
			04/06/76	17.2	13.8	
			10/25/76	22.0	9.0	

F NORTH COAST HB
F-03 SMITH RIVER HU
F-03.A LOWER SMITH RIVER HA
F-03.A1 SMITH RIVER PLAIN HSA

STATE WELL NUMBER	CO	GROUND SURFACE ELEVATION	DATE	GROUND TO WATER	WATER SURFACE ELEV.	AGENCY
17N/01W-02P01 H		31.0	04/05/77	18.5	12.5	5050
			09/24/77	20.9	10.1	5000
			11/01/77	17.6	13.4	5050
			04/04/78	17.3	13.7	
			11/08/78	NM-4		
			04/10/79	NM-9		
			11/06/79	16.3	14.7	
			04/08/80	16.9	14.1	
			09/30/80	18.3	12.7	
			03/26/81	16.0	15.0	
			10/15/81	17.5	13.5	
			10/19/82	22.9	8.1	
			03/31/83	9.0	22.0	
			10/20/83	22.0	9.0	
			10/20/83	22.0	9.0	
			03/22/84	15.9	15.1	
			10/29/84	19.8	11.2	
			03/13/85	14.1	16.9	
17N/01W-03E01 H		14.0	07/08/53	11.8	2.2	5000
			06/01/55	12.3	1.7	5001
			08/25/55	14.4	-.4	
			10/19/65	14.5	-.5	5050
			04/05/66	9.6	4.4	
			10/04/66	14.5	-.5	
			04/12/67	6.4	7.6	
			10/04/67	14.5	-.5	
			04/10/68	10.5	3.5	
			10/17/68	12.9	1.1	
			04/08/69	9.9	4.1	
			10/14/69	13.0	1.0	
			04/08/70	12.7	1.3	
			10/14/70	13.6	.4	
			04/14/71	9.7	4.3	
			10/13/71	13.0	1.0	
			04/04/72	9.9	4.1	
			10/11/72	13.0	1.0	
			04/10/73	9.9	4.1	
			09/24/73	13.4	.6	
			04/17/74	9.7	4.3	
			11/10/74	13.1	.9	
			04/28/75	9.8	4.2	
			10/13/75	12.8	1.2	
			04/06/76	10.5	3.5	
			10/25/76	NM-7		
			04/05/77	11.5	2.5	
			09/23/77	NM-1		5000

F NORTH COAST HB
F-03 SMITH RIVER HU
F-03.A LOWER SMITH RIVER HA
F-03.A1 SMITH RIVER PLAIN HSA

STATE WELL NUMBER	CO	GROUND SURFACE ELEVATION	DATE	GROUND TO WATER	WATER SURFACE ELEV.	AGENCY
17N/01W-03E01 H		14.0	11/01/77	10.9	3.1	5050
			04/04/78	10.5(4)	3.5	
			11/08/78	13.7	.3	
			04/10/79	NM-0		
			11/06/79	NM-7		
17N/01W-15M02 H		21.0	07/25/53	12.9	8.1	5000
			07/30/53	13.1	7.9	
			08/05/53	13.6	7.4	
			08/10/53	13.9	7.1	
			08/15/53	14.2	6.8	
			08/20/53	14.4	6.6	
			08/25/53	14.5	6.5	
			08/30/53	14.5	6.5	
			09/05/53	14.6	6.4	
			09/10/53	14.8	6.2	
			09/15/53	15.0	6.0	
			09/18/53	15.2	5.8	
			06/01/55	10.9	10.1	5001
			08/25/55	15.0	6.0	
			10/19/65	17.3	3.7	5050
			04/05/66	7.6	13.4	
			10/04/66	16.7	4.3	
			04/12/67	6.2	14.8	
			10/04/67	16.6	4.4	
			04/10/68	9.0	12.0	
			10/17/68	16.0	5.0	
			04/08/69	9.0	12.0	
			10/14/69	16.0	5.0	
			04/08/70	9.9	11.1	
			10/14/70	17.0	4.0	
			04/14/71	5.4	15.6	
			10/13/71	15.4	5.6	
			04/04/72	6.3	14.7	
			10/11/72	16.4	4.6	
			04/10/73	8.2	12.8	
			09/26/73	16.6	4.4	
			04/17/74	6.6	14.4	
			11/10/74	16.6	4.4	
			04/28/75	9.0	12.0	
			10/13/75	16.2	4.8	
			04/06/76	8.5	12.5	
			10/25/76	16.7	4.3	
			04/05/77	10.8	10.2	
			11/01/77	11.4	9.6	
			04/04/78	9.6	11.4	
			11/08/78	15.2(1)	5.8	

F NORTH COAST HB
F-03 SMITH RIVER HU
F-03.A LOWER SMITH RIVER HA
F-03.A1 SMITH RIVER PLAIN HSA

STATE WELL NUMBER	CO	GROUND SURFACE ELEVATION	DATE	GROUND TO WATER	WATER SURFACE ELEV.	AGENCY
17N/01W-15M02 H		21.0	04/10/79	10.2	10.8	5050
			11/06/79	13.6	7.4	
			04/08/80	8.1	12.9	
			09/30/80	16.8	4.2	
			03/25/81	9.1	11.9	
			10/15/81	13.9	7.1	
			10/19/82	16.6	4.4	
			03/30/83	2.5	18.5	
			10/20/83	15.6	5.4	
			10/20/83	15.6	5.4	
			03/22/84	4.6	16.4	
			10/29/84	12.6	8.4	
			03/13/85	10.6	10.4	
17N/01W-20Q01 H		15.0	06/10/73	2.0	13.0	5050
			09/24/73	6.0	9.0	
			04/17/74	1.5	13.5	
			11/10/74	6.0	9.0	
			04/28/75	1.9	13.1	
			10/13/75	5.7	9.3	
			04/06/76	1.7	13.3	
			10/25/76	6.5	8.5	
			06/05/77	3.3	11.7	
			09/24/77	5.7	9.3	5000
			11/01/77	3.3	11.7	5050
			04/06/78	1.6	13.4	
			11/08/78	5.5	9.5	
			04/10/79	2.3	12.7	
			11/06/79	3.5	11.5	
			04/08/80	1.7	13.3	
			09/30/80	7.4	7.6	
			03/25/81	12.1	2.9	
			10/15/81	4.0	11.0	
			10/19/82	6.5	8.5	
			03/30/83	.3	14.7	
			10/20/83	NM-6		
			10/20/83	NM-6		
			03/22/84	NM-6		
			03/13/85	NM-0		
17N/01W-27Q05 H		40.0	06/10/73	9.5	30.5	5050
			09/24/73	20.5	19.5	
			04/17/74	10.6	29.4	
			11/10/74	20.5	19.5	
			04/28/75	11.5	28.5	
			10/13/75	19.6	20.4	
			04/06/76	11.2	28.8	

F NORTH COAST HB
F-03 SMITH RIVER HU
F-03.A LOWER SMITH RIVER HA
F-03.A1 SMITH RIVER PLAIN HSA

STATE WELL NUMBER	CO	GROUND SURFACE ELEVATION	DATE	GROUND TO WATER	WATER SURFACE ELEV.	AGENCY
17N/01W-27Q05 H		40.0	10/25/76	20.2	19.8	5050
			06/05/77	18.5	21.5	
			09/24/77	21.6	18.4	5000
			11/01/77	20.3	19.7	5050
			04/06/78	10.9	29.1	
			11/08/78	19.0	21.0	
			04/10/79	13.0	27.0	
			11/06/79	14.6	25.4	
			04/08/80	10.5	29.5	
			09/30/80	19.7	20.3	
			03/25/81	10.5	29.5	
			10/15/81	17.4	22.6	
			10/19/82	19.7	20.3	
			03/30/83	4.7	35.3	
			10/20/83	19.2	20.8	
			10/20/83	19.2	20.8	
			03/22/84	8.3	31.7	
			10/29/84	18.5	21.5	
			03/13/85	12.3	27.7	
18N/01W-27P03 H		15.0	06/10/73	5.6	9.4	5050
			09/24/73	6.5	8.5	
			04/17/74	5.2	9.8	
			11/10/74	8.3	6.7	
			04/28/75	5.3	9.7	
			10/13/75	7.2	7.8	
			04/06/76	5.3	9.7	
			10/25/76	9.0	6.0	
			06/05/77	6.0	9.0	
			09/23/77	6.7	8.3	5000
			11/01/77	5.3	9.7	5050
			04/06/78	4.8	10.2	
			11/08/78	7.7	7.3	
			04/10/79	6.7	8.3	
			11/06/79	3.5	11.5	
			04/08/80	5.8	9.2	
			09/30/80	10.1	4.9	
			03/26/81	2.9	12.1	
			10/15/81	6.6	8.4	
			10/19/82	9.9	5.1	
			03/31/83	1.4	13.6	
			10/20/83	8.5	6.5	
			10/20/83	8.5	6.5	
			03/22/84	4.4(1)	10.6	
			10/29/84	6.7	8.3	
			03/13/85	7.4	7.6	

STATE WELL NUMBER	CO	GROUND SURFACE ELEVATION	DATE	GROUND TO WATER	WATER SURFACE ELEV.	AGENCY
F	NORTH COAST HB					
F-03	SMITH RIVER HU					
F-03.A	LOWER SMITH RIVER HA					
F-03.A1	SMITH RIVER PLAIN HSA					
18N/01W-35B02 H		90.0	11/28/56	18.4	71.6	5050
			04/10/79	29.5	60.5	
			04/08/80	22.6	67.4	
			09/24/80	39.4	50.6	
			03/26/81	26.6	63.4	
			10/19/82	33.0	57.0	
			03/31/83	18.5	71.5	
			10/20/83	29.6	60.4	
			10/20/83	29.6	60.4	
			03/22/84	19.6	70.4	
			10/29/84	33.9	56.1	
			03/13/85	24.7	65.3	

Appendix D
Mineral Analysis of Ground Water

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APPENDIX D

MINERAL ANALYSES OF GROUND WATER

TIME - Pacific Standard Time on a 24-hour clock

TEMP - Water temperature at time of sampling in degrees (°) Fahrenheit (F) and Celsius (C)

PH - Measure of acidity (<7) or alkalinity (>7) of water

EC - Electrical conductance in micromhos at 25°C

TDS - Gravimetric determination of total dissolved solids at 180°C

SUM - Total dissolved solids by summation of analyzed constituents

TH - Total hardness

NCH - Noncarbonate hardness - any excess of total hardness over total alkalinity

ASAR - Adjusted sodium adsorption ratio

PERCENT REACTANCE VALUE is determined by dividing the sum of the cations or anions in milliequivalents per liter into each constituent in milliequivalents per liter, arriving at a percentage. For a partial analysis, an approximate value is determined by multiplying the electrical conductance by 0.01 and using that as the cation or anion sum.

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MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	MINERAL CONSTITUENTS IN CA	MG	NA	K	MILLIGRAMS PER LITER MILLIEQUIVALENTS PER LITER PERCENT REACTANCE VALUE CACO3	SO4	CL	NO3	MILLIGRAMS PER LITER B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	F	NORTH COAST HR																
	F-01	WINCHUCK RIVER HU																
	18N/01W-05G01 H										CONTINUED							
08/09/66	0000			171	--	--	--	--	--	--	--	--	--	--				
	0000													--				
	18N/01W-05K01 H																	
07/18/67	5050				10	6.6	15	1.0	25	18	25	17.0	.0	--	102	52	0.9	
0845	5050		7.4	181	.50	.54	.65	.03	.50	.37	.71	.27		--	108	27	0.6	
					29	31	38	2	27	20	33	15						
07/11/68	0000	56.0F	6.2	175	--	--	--	--	--	--	--	--	--	--				
1130	5050	13.3C												--				S
08/27/69	0000	63.0F	6.0	182	--	--	--	--	--	--	--	--	--	--				
1520	5050	17.2C												--				S
06/24/70	0000	59 F	5.9	170	--	--	--	--	--	--	--	--	--	--				
1745	5050	15 C												--				S
08/11/71	5050	63 F	5.9	165	--	--	--	--	30	--	23	14.0	--	--		47		
1425	5050	17 C	7.2	168					.60		.65	.23		--				S
09/26/72	5050	56.0F	5.9	182	--	--	--	--	--	--	--	--	--	--				
0840	0000	13.3C												--				
09/24/73	5050	59.0F	6.1	175	--	--	--	--	--	--	--	--	--	--				
1425	0000	15.0C												--				
09/04/74	5050	63.0F	5.9	185	--	--	--	--	--	--	21	21.0	--	--		45		
1530	5050	17.2C		178							.50	.34		--				S
09/10/75	5050	58 F	6.1	183	11	4.7	14	.4	29	5.4	19	25.0	.0	--	140	46	0.9	E
1530	5050	14 C	7.6	179	.55	.39	.61	.01	.58	.11	.54	.40		--	97	18	0.6	T
					35	25	39	1	36	7	33	25						

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
					MINERAL CONSTITUENTS IN				MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE				MILLIGRAMS PER LITER					
	F		NORTH COAST HB															
	F-01		WINCHUCK RIVER HU															
	18N/01W-05601 H																	
11/29/56	5050	54.0F			7.6	7.1	14	.4	27	3.8	27	12.0	.04	.0	98	48	0.9	
	5000	12.2C	6.5	168	.38	.58	.61	.01	.54	.08	.76	.19		10.0	98	21	0.6	
					24	37	39	1	34	5	48	12						
09/11/57	5050	0 F			6.8	5.1	15	.8	14	4.8	30	13.0	.00	.1	95	38	1.1	
	5000	18 C	6.2	168	.34	.42	.65	.02	.28	.10	.85	.21		11.0	95	24	0.3	
					24	29	45	1	19	7	59	15						
08/11/58	5050				6.0	4.0	6.5	.3	8	3.0	7.8	32.0	--	.0	104	32	0.5	
1505	3334		7.5	155	.30	.33	.28	.01	.15	.06	.22	.52		6.0	70	24	0.0	TC
					33	36	30	1	17	6	23	54						
08/27/59	5050				7.2	.7	11	.7	15	1.0	20	1.7	.1	.2		21	1.0	
1500	5000		6.6	106	.36	.06	.48	.02	.30	.02	.56	.03		14.0	65	6	0.1	
					39	7	52	2	33	2	62	3						
09/ /60	5050				7.1	5.7	15	.7	10	4.0	31	19.0	.03	.0		41	1.0	
	5050		6.8	183	.25	.47	.65	.02	.20	.08	.87	.31		10.0	99	31	0.2	
					23	32	44	1	14	5	60	21						
08/30/61	5050				8.8	5.1	16	.7	10	4.0	32	21.0	.05	.0		43	1.1	
1700	5050		6.9	174	.44	.42	.70	.02	.20	.08	.90	.34		10.0	104	33	0.2	
					28	27	44	1	13	5	59	22						
09/17/62	5050				8.8	5.4	16	.8	13	5.4	31	21.0	.0	.0	107	44	1.0	
	5050		7.4	186	.44	.44	.70	.02	.26	.11	.87	.34		9.6	106	31	0.3	
					28	28	44	1	16	7	55	22						
07/10/63	5050				9.0	3.3	21	.6	12	1.0	37	14.0	.0	.2	108	36	1.5	
1035	5050		7.0	155	.45	.27	.91	.02	.24	.02	1.04	.23		9.4	102	24	0.3	
					27	16	55	1	16	1	68	15						
08/26/64	5050				--	--	15	--	11	--	34	--	--	--		44		
1625	5050		7.0	180			.65		.22		.96			--				
							42											S
07/07/65	5050				--	--	14	--	11	--	33	12.0	--	--		40		
1515	000C		7.4	177			.61		.22		.93	.19		--				
							43											S

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
					MINERAL CONSTITUENTS IN				MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE				MILLIGRAMS PER LITER					
F		NORTH COAST HB																
F-01		WINCHUCK RIVER HU																
18N/01W-05K01 H											CONTINUED							
08/10/77	5000	58.1F		145	14	4.6	14	.6	25	1.2	17	25.0	.01	.1		54	0.8	
	5000	14.5C		169	.70	.38	.61	.02	.50	.02	.48	.40		15.0	106	29	0.6	
					41	22	36	1	36	1	34	29						S
09/08/78	5050	59.0F	6.0	180	--	--	--	--	--	--	--	--	--	--				
1215	0000	15.0C												--				
09/13/79	5050	72.0F	6.1	185	--	--	--	--	--	--	--	--	--	--				
0955	0000	22.2C												--				
06/23/80	5050	58.0F	6.1	184	--	--	--	--	--	--	--	--	--	--				
1200	0000	14.4C												--				
09/28/81	5050	60.0F	6.0	170	10	5.0	15	.6	27	--	17	--	.1	--		45	1.0	
1055	5050	15.5C	7.6	181	.50	.41	.65	.02	.54		.48			--		19	0.6	
					32	26	41	1										S
08/05/82	5050		6.1	175	--	--	--	--	--	--	--	--	--	--				
1015	0000													--				
09/17/85	5050	57 F	5.9	175	--	--	--	--	--	--	--	--	--	--				
1000	0000	14 C												--				
06/05/86	5050	57.0F	6.1	175	10	6.0	14	--	30	--	17	26.0	--	--		50	0.9	
0930	5050	13.9C	7.9	181	.50	.49	.61		.60		.48	.42		--		20	0.6	
					31	31	38											S
18N/01W-08Q02 H																		
08/20/54	5050	62 F			5.4	3.5	8.1	.4	21	5.9	12	3.2	.14	.0		28	0.7	
	5000	17 C	6.6	102	.27	.29	.35	.01	.42	.12	.34	.05		12.0	63	7	0.2	
					29	32	38	1	45	13	37	5						

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	MINERAL CONSTITUENTS IN: MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE													MILLIGRAMS PER LITER				
	F	NORTH COAST HB																
	F-01	WINCHUCK RIVER HU																
	18N/01W-05K01 H										CONTINUED							
08/10/77	5000	58.1F		145	14	4.6	14	.6	25	1.2	17	25.0	.01	.1		54	0.8	
	5000	14.5C		169	.70	.38	.61	.02	.50	.02	.48	.40		15.0	106	29	0.6	
					41	22	36	1	36	1	34	29						S
09/08/78	5050	59.0F	6.0	180	--	--	--	--	--	--	--	--	--	--				
1215	0000	15.0C												--				
09/13/79	5050	72.0F	6.1	185	--	--	--	--	--	--	--	--	--	--				
0955	0000	22.2C												--				
06/23/80	5050	58.0F	6.1	184	--	--	--	--	--	--	--	--	--	--				
1200	0000	14.4C												--				
09/28/81	5050	60.0F	6.0	170	10	5.0	15	.6	27	--	17	--	.1	--		45	1.0	
1055	5050	15.5C	7.6	181	.50	.41	.65	.02	.54		.48			--		19	0.6	
					32	26	41	1										S
08/05/82	5050		6.1	175	--	--	--	--	--	--	--	--	--	--				
1015	0000													--				
09/17/85	5050	57 F	5.9	175	--	--	--	--	--	--	--	--	--	--				
1000	0000	14 C												--				
06/05/86	5050	57.0F	6.1	175	10	6.0	14	--	30	--	17	26.0	--	--		50	0.9	
0930	5050	13.9C	7.9	181	.50	.49	.61		.60		.48	.42		--		20	0.6	
					31	31	38											S
	18N/01W-08Q02 H																	
08/20/54	5050	62 F			5.4	3.5	8.1	.4	21	5.9	12	3.2	.14	.0		28	0.7	
	5000	17 C	6.6	102	.27	.29	.35	.01	.42	.12	.34	.05		12.0	63	7	0.2	
					29	32	38	1	45	13	37	5						

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	F F-03 F-03.4 F-03.A1 16N/01W-02001 H	NORTH COAST HR SMITH RIVER HU LOWER SMITH RIVER HA SMITH RIVER PLAIN HSA									CONTINUED							
07/10/63	5050				16	10	17	.3	103	1.0	8.2	.0	.1	.2	154	31	1.3	
1250	5050		8.0	227	.80	.82	.74	.01	2.06	.02	.23	.00		29.0	143	0	1.4	
					34	35	31	0	89	1	10	0						
09/01/64	5050				--	--	14	--	92	--	11	--	--	--		82		
1700	5050		8.4	205			.61		1.84		.31			--				
							27											S
09/22/65	5050				--	--	15	--	94	--	11	--	--	--		84		
1630	0000		8.1	223			.65		1.88		.31			--				
							28											S
08/16/66	5050				12	9.7	14	.5	83	1.5	8.7	.9	.1	--	113	70	0.7	
1515	5050		7.0	194	.60	.80	.61	.01	1.66	.03	.25	.01		--	97	0	1.0	
					30	40	30	0	85	2	13	1						
07/17/67	5050	59.0F			--	--	--	--	--	--	--	--	--	--				
1420	5050	15.0C		211										--				
06/24/70	5050	62 F	6.5	155	9.8	7.9	9.4	.6	62	.0	6.9	1.4	.0	--	95	57	0.5	
1500	5050	17 C	7.0	150	.49	.65	.41	.02	1.24	.00	.19	.02		--	73	0	0.6	T
					31	41	26	1	86	0	13	1						
03/12/71	5050	59 F	6.5	185	--	--	--	--	60	--	8.3	--	--	--		63		
0930	5050	15 C	7.1	169					1.20		.23			--				
																		S
09/25/72	5050	58.0F		190	--	--	--	--	--	--	--	--	--	--				
1445	5050	14.4C												--				
																		S
09/23/73	5050	58.0F	6.7	175	--	--	--	--	--	--	--	--	--	--				
1135	0000	14.4C												--				
																		S
09/04/74	5050	59.0F	6.7	170	--	--	--	--	--	--	--	--	--	--				
1310	0000	15.0C												--				
																		S
09/10/75	5050	56.0F	6.8	185	--	--	--	--	--	--	--	--	--	--				
1345	0000	13.3C												--				
																		S

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
					MINERAL CONSTITUENTS IN				MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE				MILLIGRAMS PER LITER					
	F F-03 F-03.A F-03.A1	NORTH COAST HB SMITH RIVER HU LOWER SMITH RIVER HA SMITH RIVER PLAIN HSA																
	16N/01W-02D01 H										CONTINUED							
06/07/76	5050	56.0F	6.8	220	--	--	--	--	81	--	9.1	1.3	--	--		72		
1400	5050	13.3C	7.4	192					1.62		.26	.02		--				
																		S
08/10/77	5000	57.2F		200	18	11	11	.4	90	14	9.0	.1	.04	.1		90	0.5	
	5000	14.0C		201	.90	.90	.48	.01	1.80	.29	.25	.00		32.0	150	0	0.7	
					39	39	21	0	77	12	11	0						
09/08/78	5050	58.0F	6.7	218	--	--	--	--	--	--	--	--	--	--				
0910	0000	14.4C												--				
	16N/01W-02D03 H																	
10/10/84	5050	58.0F	7.0	277	19	12	16	.5	109	1.0	11	1.7	.0	--	167	97	0.7	
1430	5050	14.4C	8.1	242	.95	.99	.70	.01	2.18	.02	.31	.03		--	127	0	1.1	T
					36	37	26	0	86	1	12	1						
09/17/85	5050	58 F	7.0	262	--	--	--	--	--	--	--	--	--	--				
0810	0000	14 C												--				
																		S
06/04/85	5050	58 F	7.0	260	--	--	--	--	--	--	--	--	--	--				
0805	0000	14 C												--				
																		S
	16N/01W-03F01 H																	
06/03/86	5050	58.0F	6.7	140	5.0	10	7.0	.0	46	5.0	9.0	7.9	.0	--	98	54	0.4	
1325	5050	14.4C	7.8	143	.25	.82	.30	.00	.92	.10	.25	.13		--	71	8	0.4	T
					18	60	22		66	7	18	9						
	16N/01W-03N07 H																	
06/12/62	5050	58 F			4.7	8.4	7.3	.3	32	2.6	12	12.0	.06	.0		46	0.5	
	5050	14 C	6.9	131	.23	.69	.32	.01	.64	.05	.34	.19		--	67	14	0.3	
					19	55	26	1	52	4	28	16						

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	MINERAL CONSTITUENTS IN CA	MG	NA	K	MILLIGRAMS PER LITER MILLIEQUIVALENTS PER LITER PERCENT REACTANCE VALUE CACO3	SO4	CL	NO3	MILLIGRAMS PER LITER B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	F	NORTH COAST HB																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.A1	SMITH RIVER PLAIN HSA																
	16N/01W-03N08 H																	
06/03/86	5050	59.0F	6.7	135	3.0	8.0	8.0	.2	23	4.0	8.0	26.0	.0	--	82	40	0.6	
1505	5050	15.0C	7.9	127	.15	.66	.35	.01	.46	.08	.23	.42		--	71	18	0.3	
					13	56	30	1	39	7	19	35						
	16N/01W-05L01 H																	
08/27/53	5050				6.0	6.8	6.3	2.4	43	2.3	10	1.3	--	--		43	0.4	
	5000		6.7	126	.30	.56	.27	.06	.86	.05	.28	.02		--	61	0	0.4	
					25	47	23	5	71	4	23	2						
	16N/01W-07F01 H																	
09/28/53	5050				22	14	15	1.1	105	5.2	22	3.7	--	--		112	0.6	
	5000		7.6	282	1.10	1.15	.65	.03	2.10	.11	.62	.06		--	146	8	1.0	
					28	39	22	1	73	4	21	2						
10/29/58	5050				20	17	13	1.5	116	7.0	18	.0	--	.0	214	117	0.5	E
1230	5050		7.7	290	1.00	1.40	.57	.04	2.32	.15	.51	.00		18.0	164	4	0.9	T
					33	47	19	1	78	5	17	0						
09/14/59	5050				26	14	17	1.6	120	4.6	2.6	.1	.1	.0		122	0.7	
1540	5000		8.1	304	1.30	1.15	.74	.04	2.40	.10	.07	.00		26.0	164	3	1.1	
					40	36	23	1	93	4	3	0						S
09/ /60	5050				32	14	17	1.0	130	1.0	29	.9	.05	.1		138	0.6	
	5050		8.2	347	1.60	1.15	.74	.03	2.60	.02	.82	.01		19.0	192	8	1.1	
					45	33	21	1	75	1	24	0						
08/30/61	5050				31	12	16	1.0	123	.8	26	1.2	.04	.1		129	0.6	
1430	5050		8.1	308	1.55	.99	.70	.03	2.46	.02	.73	.02		19.0	181	4	1.1	
					47	30	21	1	76	1	23	1						
09/17/62	5050				33	13	16	1.0	130	.2	32	.6	.0	.0	191	135	0.6	
1000	5050		8.3	329	1.65	1.07	.70	.03	2.60	.00	.90	.01		20.0	194	6	1.1	
					48	31	20	1	74	0	26	0						

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
					MINERAL CONSTITUENTS IN				MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE				MILLIGRAMS PER LITER					
	F	NORTH COAST HB																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.A1	SMITH RIVER PLAIN HSA																
	16N/01W-07H01 H																	
06/14/62	5050	55 F			21	18	19	1.0	107	5.1	40	1.1	.05	.1		128	0.7	
	5050	13 C	7.9	336	1.05	1.44	.83	.03	2.14	.11	1.13	.02		27.0	196	20	1.2	
					31	44	24	1	63	3	33	1						
	16N/01W-08C04 H																	
06/03/86	5050	60.0F	6.5	140	3.0	7.0	11	.6	23	4.0	18	14.0	.0	--	80	36	0.8	
1105	5050	15.5C	7.9	139	.15	.58	.48	.02	.46	.08	.51	.23		--	71	14	0.4	
					12	47	39	2	36	6	40	18						
	16N/01W-08D05 H																	
06/03/86	5050	57.0F	6.4	195	4.0	8.0	23	.6	36	10	15	32.0	.0	--	121	43	1.5	
1140	5050	13.9C	7.8	192	.20	.66	1.00	.02	.72	.21	.42	.52		--	114	7	1.1	
					11	35	53	1	39	11	22	28						
	16N/01W-09H01 H																	
08/27/53	5050				2.1	2.4	4.8	.1	12	2.1	8.8	4.9	--	--		15	0.5	
	5000		6.4	57	.10	.20	.21	.00	.24	.04	.25	.08		--	32	3	0.1	
					20	39	41		39	7	41	13						
	16N/01W-09H04 H																	
06/03/86	5050	57.0F	6.7	165	5.0	11	10	.3	49	3.0	17	5.0	.0	--	102	58	0.6	
1230	5050	13.9C	7.9	168	.25	.90	.44	.01	.98	.06	.48	.08		--	81	9	0.6	T
					16	56	28	1	61	4	30	5						
	16N/01W-14M02 H																	
06/04/86	5050	61.0F	5.7	90	2.0	3.0	9.0	1.1	13	1.0	12	4.9	.0	--	48	18	0.9	
1350	5050	16.1C	7.9	83	.10	.25	.39	.03	.26	.02	.34	.08		--	41	5	0.0	
					13	32	51	4	37	3	49	11						
	16N/01W-15C01 H																	
08/27/53	5050	53.0F			4.2	6.3	7.7	.3	28	1.8	11	17.0	--	.0	65	36	0.6	
	5000	11.7C	6.4	117	.21	.52	.33	.01	.56	.04	.31	.27		--	65	9	0.3	
					20	49	31	1	47	3	26	23						
12/04/56	5050	50.0F			4.4	6.8	9.2	.5	32	.0	9.0	19.0	.0	.1	85	39	0.6	
	5000	10.0C	6.6	129	.22	.56	.40	.01	.64	.00	.25	.31		17.0	85	7	0.4	
					18	47	34	1	53	0	21	26						
12/04/57	5050				5.2	8.5	9.4	.7	31	3.8	12	23.0	.0	.0	101	48	0.6	E
	5000		7.1	142	.26	.70	.41	.02	.62	.08	.34	.37		19.0	100	17	0.4	
					19	50	29	1	44	6	24	26						

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	MINERAL CONSTITUENTS IN CA	MG	NA	K	MILLIGRAMS PER LITER MILLIEQUIVALENTS PER LITER PERCENT REACTANCE VALUE CACO3	SO4	CL	NO3	MILLIGRAMS PER LITER B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	F	NORTH COAST HR																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.A1	SMITH RIVER PLAIN HSA																
	16N/01W-15C01 H										CONTINUED							
10/29/58	5050	56.0F			5.0	7.0	10	.0	40	5.0	9.0	6.0	--	.1	90	41	0.7	
1420	5050	13.3C	7.4	129	.25	.58	.44	.00	.80	.10	.25	.10		19.0	85	2	0.5	
					20	46	35		64	8	20	8						
10/ /59	5050				3.8	5.6	8.1	.2	34	.6	7.2	5.5	.0	.0		33	0.6	
	5000		7.7	102	.19	.46	.35	.01	.68	.01	.20	.09		19.0	70	0	0.4	
					19	46	35	1	69	1	20	9						
09/ /60	5050				2.9	5.1	7.2	.6	21	2.1	12	5.2	.04	.0		28	0.6	
1550	5050		7.4	104	.14	.42	.31	.02	.42	.04	.34	.08		16.0	64	7	0.2	
					16	47	35	2	48	5	39	9						
08/29/61	5050				5.4	9.4	9.2	.4	36	1.6	14	18.0	.02	.0		52	0.6	
1615	5050		6.3	152	.27	.77	.40	.01	.72	.03	.39	.29		22.0	102	16	0.5	
					19	53	28	1	50	2	27	20						
09/05/62	5050				3.6	5.8	7.1	.4	33	2.0	8.0	4.8	.0	.0	73	33	0.5	E
1045	5050		7.7	101	.18	.48	.31	.01	.66	.04	.23	.08		19.0	70	0	0.3	
					18	49	32	1	65	4	23	8						
07/10/63	5050				3.2	2.9	5.5	.4	15	2.4	11	.0	.0	.1	38	20	0.5	
1315	5050		6.7	61	.16	.24	.24	.01	.30	.05	.31	.00		12.0	46	5	0.0	T
					25	37	37	2	45	8	47	0						
09/01/64	5050				--	--	7.7	--	34	--	13	--	--	--		46		
1645	5050		7.6	116			.33		.68		.37			--				
							26											S
07/07/65	5050				--	--	6.5	--	20	--	10	2.4	--	--		23		
1655	0000		7.8	84			.28		.40		.28	.04		--				
							38											S
08/09/66	5050				5.4	8.1	9.4	.6	34	2.3	15	11.0	.0	--	90	47	0.6	
	5050		6.7	143	.27	.67	.41	.02	.68	.05	.42	.18		--	72	13	0.5	
					20	49	30	1	51	4	32	14						

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
					MINERAL CONSTITUENTS IN	MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE							MILLIGRAMS PER LITER					
	F	NORTH COAST HB																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.A1	SMITH RIVER PLAIN HSA																
	16N/01W-15F02 H																	
06/04/86	5050	57.0F	5.9	132	6.0	9.0	9.0	.4	49	2.0	10	3.3	.0	--	79	52	0.5	
1450	5050	13.9C	8.0	142	.30	.74	.39	.01	.98	.04	.28	.05		--	69	3	0.5	
					21	51	27	1	73	3	21	4						
	16N/01W-16D02 H																	
04/30/53	5050				4.9	6.3	13	.5	38	2.0	19	3.3	.01	.0		38	0.9	
	5000		6.6	147	.24	.52	.57	.01	.76	.04	.54	.05		16.0	88	0	0.7	
					18	39	43	1	55	3	39	4						
07/06/58	5050				8.0	12	12	.3	60	.0	25	2.0	.04	.0	130	70	0.6	E
	5050		7.5	184	.40	.99	.52	.01	1.20	.00	.71	.03		8.0	103	10	0.7	T
					21	52	27	1	62	0	37	2						
09/04/59	5050				6.2	13	11	.4	60	3.0	20	1.5	.0	.0		70	0.6	
1400	5000		7.6	192	.31	.11	.48	.01	1.20	.06	.56	.02		28.0	107	0	0.7	C
					24	12	53	1	65	3	30	1						S
09/ /60	5050				8.2	13	10	.6	72	3.3	16	1.6	.02	.0		76	0.5	
	5050		8.0	201	.41	1.07	.44	.02	1.44	.07	.45	.03		26.0	122	2	0.6	
					21	55	23	1	72	4	23	2						
08/29/61	5050				6.9	13	10	.4	60	1.6	22	2.3	.03	.1		70	0.5	
1600	5050		7.5	189	.34	1.07	.44	.01	1.20	.03	.62	.04		28.0	120	11	0.6	
					18	58	24	1	63	2	33	2						
09/05/62	5050				7.4	13	11	.4	66	3.0	21	1.7	.0	.0	127	74	0.6	
1030	5050		8.1	195	.37	1.07	.48	.01	1.32	.06	.59	.03		28.0	125	6	0.7	
					19	55	25	1	66	3	30	2						
	16N/01W-16D02 H																	
12/04/56	5050	52 F			8.0	13	11	.3	72	1.0	16	1.8	.00	.1		72	0.6	
	5000	11 C	6.8	182	.40	1.07	.48	.01	1.44	.02	.45	.03		29.0	123	2	0.7	
					20	55	24	1	74	1	23	2						
09/11/57	5050				6.4	12	10	.6	57	1.9	20	1.9	.00	.0		65	0.5	
	5000		7.4	176	.32	.99	.44	.02	1.14	.04	.56	.03		28.0	115	9	0.6	
					18	56	25	1	64	2	32	2						

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
			MINERAL CONSTITUENTS IN						MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE				MILLIGRAMS PER LITER					
	F	NORTH COAST HB																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.A1	SMITH RIVER PLAIN HSA																
	16N/01W-17K01 H																	
10/29/58	5050				5.0	11	22	.3	47	6.0	25	21.0	--	.1	147	56	1.3	
1310	5050		7.5	210	.25	.90	.96	.01	.94	.12	.71	.34		14.0	132	11	1.2	
					12	42	45	0	45	6	34	16						
09/18/59	5050				8.0	14	14	.5	59	14	23	2.2	.0	.2		76	0.7	
1600	5000		6.9	208	.40	1.15	.61	.01	1.18	.29	.65	.04		32.0	143	19	0.8	
					18	53	28	0	55	13	30	2						
	16N/01W-17K02 H																	
09/01/64	5050				--	--	21	--	54	--	24	--	--	--		88		
1630	5050		8.1	284			.91		1.08		.68			--				
							34											S
09/16/65	5050				6.3	14	25	1.0	49	3.6	30	36.0	.00	--	161	74	1.3	
1330	0000		7.0	282	.31	1.15	1.09	.03	.98	.07	.85	.58		--	145	24	1.4	
					12	45	42	1	40	3	34	23						
08/16/66	5050				9.4	22	29	.9	41	5.7	39	85.0	.1	--	249	115	1.2	
1440	5050		6.7	416	.47	1.81	1.26	.02	.82	.12	1.10	1.37		--	216	73	1.4	
					13	51	35	1	24	4	32	40						
07/18/67	5050	69.0F			--	--	31	--	39	--	46	92.0	--	--		104		
1045	5050	20.5C	7.6	399			1.35		.78		1.30	1.48		--				
							39											S
07/10/68	5050	60 F	6.2	285	6.4	12	26	--	38	--	29	50.0	--	--		66	1.4	
1430	5050	16 C	7.0	279	.32	1.00	1.13		.76		.82	.81		--		28	1.3	
					9	29	33											S
09/24/80	5050	64.4F	6.6	250	5.8	14	14	1.0	73	1.4	15	9.3	.03	.1		72	0.7	
1345	5000	18.0C			.29	1.15	.61	.03	1.46	.03	.42	.15		24.0	128	0	0.9	
					14	55	29	1	71	1	20	7						
	16N/01W-17K03 H																	
10/29/58	5050				5.0	11	22	.3	47	6.0	25	21.0	--	.1		56	1.3	
	5000		7.5	210	.25	.90	.96	.01	.94	.12	.71	.34		14.0	132	11	1.2	
					12	42	45	0	45	6	34	16						

MINERAL ANALYSES OF GROUND WATER

F NORTH COAST HR
F-03 SMITH RIVER HU
F-03.A LOWER SMITH RIVER HA
F-03.A1 SMITH RIVER PLAIN HSA

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	MINERAL CONSTITUENTS IN MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE													MILLIGRAMS PER LITER				
	16N/01W-17K04 H																	
06/03/86	5050	57.0F	6.3	140	4.0	8.0	10	.4	29	6.0	18	3.7	.C	--	80	43	0.7	
0950	5050	13.9C	7.9	138	.20	.66	.44	.01	.58	.12	.51	.06		--	67	14	0.4	
					15	50	34	1	46	9	40	5						
	16N/01W-18F01 H																	
08/27/53	5050	53.0F			7.6	14	19	.4	65	5.5	36	3.4	--	--	126	76	0.9	
	5000	11.7C	7.0	251	.38	1.15	.83	.01	1.30	.11	1.02	.05		--	125	12	1.2	
					16	49	35	0	52	4	41	2						
12/09/56	5050	52.0F			6.8	19	24	.2	95	1.9	38	.1	.08	.0	172	97	1.1	
	5000	11.1C	6.9	292	.34	1.56	1.04	.01	1.90	.04	1.07	.00		25.0	172	0	1.6	
					12	53	35	0	63	1	36	0						
12/04/57	5050				7.2	20	27	.5	105	4.6	36	.0	.02	.0	182	101	1.2	F
	5000		7.8	182	.36	1.64	1.17	.01	2.10	.10	1.02	.00		24.0	182	0	1.8	C
					11	52	37	0	65	3	32	0						
09/25/58	5050				7.0	18	29	.3	90	5.0	44	6.0	--	.3	219	94	1.3	
1550	5050		7.3	313	.35	1.48	1.26	.01	1.80	.10	1.24	.10		21.0	184	2	1.9	
					11	48	41	0	56	3	38	3						
	16N/01W-19J01 H																	
04/30/53	5050	0 F			4.9	8.9	10	.6	39	4.2	14	6.1	.02	.0	90	49	0.6	
	5000	18 C	6.7	157	.24	.73	.44	.02	.78	.09	.39	.10		17.0	89	10	0.5	
					17	51	31	1	57	7	29	7						
	16N/01W-20A02 H																	
04/30/53	5050	0 F			3.1	7.1	21	.5	37	12	19	6.8	.06	.0	105	37	1.5	
	5000	18 C	6.8	175	.15	.58	.91	.01	.74	.25	.54	.11		13.0	105	0	1.0	
					9	35	55	1	45	15	33	7						
12/04/56	5050	52.0F			3.6	6.8	16	.4	37	4.8	12	19.0	.0	.0	108	37	1.1	
	5000	11.1C	6.5	159	.18	.56	.70	.01	.74	.10	.34	.31		23.0	108	0	0.8	
					12	39	48	1	50	7	23	21						
12/04/57	5050	0 F			4.4	14	22	1.0	38	12	19	48.0	.05	.0	166	67	1.2	
	5000	18 C	6.7	257	.22	1.15	.96	.03	.76	.25	.54	.77		23.0	166	31	1.1	
					9	43	41	1	33	11	23	33						
10/29/58	5050				6.0	7.0	16	.3	36	6.0	17	16.0	--	.0	116	46	1.0	
1145	5050		7.0	174	.30	.58	.70	.01	.72	.12	.48	.26		7.0	97	8	0.8	
					19	35	44	1	46	8	30	16						

MINERAL ANALYSES OF GROUND WATER

F NORTH COAST HB
F-03 SMITH RIVER HU
F-03.A LOWER SMITH RIVER HA
F-03.A1 SMITH RIVER PLAIN HSA

DATE / TIME	SAMPLER / LAB	TEMP	FIELD / LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B / TURB	F / SIO2	TDS / SUM	TH / NCH	SAR / ASAR	REM
					MINERAL CONSTITUENTS IN				MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE				MILLIGRAMS PER LITER					
16N/01W-20A02 H											CONTINUED							
09/18/59	5050				5.6	11	19	.9	39	8.0	22	25.0	.0	.0		58	1.1	
1645	5000		6.9	208	.28	.90	.83	.02	.78	.17	.62	.40		25.0	140	20	1.0	
					14	44	41	1	40	9	31	20						
09/ /60	5050				5.6	15	22	.8	37	8.6	26	49.0	.04	.0		77	1.1	
	5050		7.4	298	.28	1.23	.96	.02	.74	.18	.73	.79		22.0	171	39	1.1	
					11	49	39	1	30	7	30	32						
08/29/61	5050				4.3	8.4	20	.6	30	9.9	20	27.0	.07	.0		45	1.3	
1500	5050		6.4	197	.21	.69	.87	.02	.60	.21	.56	.44		20.0	128	15	0.9	
					12	39	49	1	33	12	31	24						
07/30/62	5050	56.0F			7.2	16	25	.7	44	8.0	30	49.0	.0	.0	180	84	1.2	
1545	5050	13.3C	7.8	297	.36	1.32	1.09	.02	.88	.17	.85	.79		22.0	184	40	1.3	
					13	47	39	1	33	6	32	29						
09/01/64	5050				--	--	22	--	36	--	20	--	--	--		63		
1620	5050		8.0	240			.96		.72		.56			--				
							43											S
07/07/65	5050				--	--	26	--	32	--	23	48.0	--	--		75		
1635	5050		7.8	288			1.13		.64		.65	.77		--				
							43											S
03/16/66	5050			223	--	--	--	--	--	--	--	--	--	--				
	0000													--				
16N/01W-20A03 H																		
/ /61	5050				5.4	9.1	14	.6	48	4.4	15	12.0	.07	.0		51	0.9	
	5050		7.7	172	.27	.75	.61	.02	.96	.09	.42	.19		25.0	114	3	0.8	
					16	45	37	1	58	5	25	11						
16N/01W-20B01 H																		
04/30/53	5050	0 F			5.3	13	17	.4	57	6.3	22	8.3	.03	.0	133	67	0.9	
	5000	18 C	7.6	210	.26	1.07	.74	.01	1.14	.13	.62	.13		26.0	133	10	1.0	
					13	51	36	0	56	6	31	6						
12/04/56	5050	52.0F			4.8	11	17	.4	59	5.8	12	14.0	.0	.0	127	56	1.0	
	5000	11.1C	6.9	195	.24	.90	.74	.01	1.13	.12	.34	.23		27.0	127	0	1.1	
					13	48	39	1	63	6	18	12						

MINERAL ANALYSES OF GROUND WATER

F NORTH COAST HB
F-03 SMITH RIVER HU
F-03.A LOWER SMITH RIVER HA
F-03.A1 SMITH RIVER PLAIN HSA

CONTINUED

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	16N/01W-20B01 H																	
12/04/57	5050	0 F			3.2	13	19	.8	59	12	16	14.0	.01	.0	140	60	1.1	
	5000	18 C	7.0	206	.16	1.07	.83	.02	1.18	.25	.45	.23		27.0	140	3	1.2	
					8	51	40	1	56	12	21	11						
06/14/62	5050				6.5	13	18	.7	70	4.9	16	19.0	.06	.0		71	0.9	
	5050		7.4	230	.32	1.07	.78	.02	1.40	.10	.45	.31		26.0	146	0	1.1	
					15	49	36	1	62	4	20	14						
	16N/01W-20H01 H																	
04/30/53	5050				4.4	7.8	15	.7	21	3.5	23	25.0	.09	.0		43	1.0	
	5000		6.5	172	.22	.64	.65	.02	.42	.07	.65	.40		9.2	101	22	0.5	
					14	42	42	1	27	5	42	26						
12/04/56	5050				4.8	11	13	.5	48	3.8	16	18.0	.01	.0		56	0.8	
	5000		6.7	181	.24	.90	.57	.01	.96	.08	.45	.29		19.0	115	9	0.7	
					14	52	33	1	54	4	25	16						
12/04/57	5050				6.4	15	16	.9	35	6.7	33	30.0	.0	.0		77	0.8	
	5000		7.5	250	.32	1.23	.70	.02	.70	.14	.93	.48		19.0	148	43	0.8	
					14	54	31	1	31	6	41	21						
10/29/58	5050				8.0	17	17	.7	50	4.0	37	33.0	.0	.0	180	90	0.8	
1000	5050		6.6	260	.40	1.40	.74	.02	1.00	.08	1.04	.53		7.0	154	40	0.9	
					16	55	29	1	38	3	39	20						
09/18/59	5050				7.6	15	15	.8	57	10	22	18.0	.0	.1		82	0.7	
1620	5000		7.7	237	.38	1.23	.65	.02	1.14	.21	.62	.29		23.0	146	24	0.9	
					17	54	29	1	50	9	27	13						
11/29/60	5050	57.0F			2.2	5.2	11	.9	16	6.7	14	9.5	.06	.0		27	0.9	
1510	5050	13.9C	7.0	126	.11	.43	.48	.02	.32	.14	.39	.15		10.0	69	11	0.2	
					11	41	46	2	32	14	39	15						
08/29/61	5050				5.0	9.1	13	.6	37	6.7	17	15.0	.06	.1		50	0.8	
1530	5050		7.2	167	.25	.75	.57	.02	.74	.14	.48	.24		17.0	106	13	0.7	
					16	47	36	1	46	9	30	15						
07/30/62	5050	56.0F			6.0	12	15	.9	48	7.0	19	24.0	.0	.0	118	66	0.8	
1510	5050	13.3C	7.5	211	.30	.99	.65	.02	.96	.15	.54	.39		19.0	132	17	0.8	
					15	51	33	1	47	7	26	19						

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	F	NORTH COAST HB																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.A1	SMITH RIVER PLAIN HSA																
	16N/01W-20H01 H										CONTINUED							
07/10/63	5050				3.7	8.0	14	1.0	29	6.6	16	16.0	.1	--	90	42	0.9	
1405	5050		7.3	158	.18	.66	.61	.03	.58	.14	.45	.26		--	83	13	0.6	
					12	45	41	2	41	10	31	18						
09/01/64	5050				--	--	14	--	50	--	15	--	--	--		64		
1610	5050		7.5	197			.61		1.00		.42			--				
							32											S
07/07/65	5050				--	--	14	--	33	--	17	19.0	--	--		47		
1630	0000		7.9	177			.61		.66		.48	.31		--				
							39											S
08/16/66	5050				--	--	--	--	--	--	--	19.0	--	--				
1430	0000			182								.31		--				
																		S
07/18/67	5050	62.0F			--	--	15	--	28	--	15	12.0	--	--		44		
1025	5050	16.7C	7.6	164			.65		.56		.42	.19		--				
							42											S
06/24/70	5050	58 F	6.1	158	--	--	--	--	30	--	16	11.0	--	--		43		
1400	5050	14 C	7.3	155					.60		.45	.18		--				
																		S
08/11/71	5050	66 F	5.9	150	--	--	--	--	--	--	--	--	--	--				
1610	0000	19 C												--				
																		S
09/25/72	5050	58.0F	6.1	170	--	--	--	--	--	--	--	--	--	--				
1410	0000	14.4C												--				
																		S
09/24/73	5050	59.0F	6.2	190	--	--	--	--	--	--	16	16.0	--	--		59		
1510	5050	15.0C		166							.45	.26		--				
																		S
09/10/75	5050	58.0F	6.3	180	--	--	--	--	--	--	--	--	--	--				
1615	0000	14.4C												--				
																		S
06/07/76	5050	56.0F	6.1	160	--	--	--	--	--	--	--	--	--	--				
1610	0000	13.3C												--				
																		S

MINERAL ANALYSES OF GROUND WATER

F NORTH COAST HR
F-03 SMITH RIVER HU
F-03.A LOWER SMITH RIVER HA
F-03.A1 SMITH RIVER PLAIN HSA
16N/01W-20H01 H

CONTINUED

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
					MINERAL CONSTITUENTS IN				MILLIGRAMS PER LITER MILLIEQUIVALENTS PER LITER PERCENT REACTANCE VALUE				MILLIGRAMS PER LITER					
08/10/77	5000	56.3F		170	5.0	12	15	.7	52	8.7	20	--	.08	.0		62	0.8	
	5000	13.5C		201	.25	.99	.65	.02	1.04	.18	.56			20.0	113	10	0.9	
					13	52	34	1										S
09/08/78	5050	62.0F	6.1	195	--	--	--	--	--	--	--	--	--	--				
1300	0000	16.7C												--				
09/13/79	5050	61.0F	6.2	200	--	--	--	--	--	--	--	--	--	--				
1045	0000	16.1C												--				
06/23/80	5050	64.0F	6.2	146	4.0	6.0	12	.9	24	--	13	--	--	--		34	0.9	
1300	5050	17.8C	7.5	143	.20	.49	.52	.02	.48		.37			--		11	0.4	
					16	40	42	2										S
09/28/81	5050	62.0F	6.2	195	--	--	--	--	--	--	--	--	--	--				
1230	0000	16.7C												--				
																		S
08/05/82	5050		6.1	200	--	--	--	--	--	--	--	--	--	--				
0900	0000													--				
																		S
10/10/84	5050	57.0F	6.8	192	--	--	--	--	--	--	--	--	--	--				
1340	0000	13.9C												--				
																		S
09/17/85	5050	58.0F	6.3	190	5.0	12	13	--	50	--	18	8.8	--	--		62	0.7	
0750	5050	14.4C	8.2	192	.25	.99	.57		1.00		.51	.14		--		12	0.7	
					14	55	31											S
06/03/86	5050	57.0F	6.7	120	3.0	6.0	9.0	1.4	23	10	12	7.4	.0	--	82	32	0.7	
0735	5050	13.9C	8.4	124	.15	.49	.39	.04	.46	.21	.34	.12		--	63	9	0.3	T
					14	46	36	4	41	19	30	11						

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
					MINERAL CONSTITUENTS IN				MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE				MILLIGRAMS PER LITER					
	F	NORTH COAST HB																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.A1	SMITH RIVER PLAIN HSA																
	16N/01W-20H02 H																	
04/30/53	5050	0 F			7.6	10	11	.8	50	14	13	1.0	.12	.0	95	60	0.6	
	5000	18 C	6.5	186	.38	.82	.48	.02	1.00	.29	.37	.02		7.6	95	10	0.6	
					22	48	28	1	60	17	22	1						
	16N/01W-20H04 H																	
09/18/59	5050				8.0	14	14	.5	59	14	23	2.2	.0	.2		76	0.7	
	5000		6.9	208	.40	1.15	.61	.01	1.18	.29	.65	.04		32.0	143	19	0.8	
					16	53	28	0	55	13	30	2						
11/29/60	5050	57 F			5.5	14	12	.5	57	4.6	19	8.3	.05	.1		71	0.6	
	5050	14 C	7.8	205	.27	1.15	.52	.01	1.14	.10	.54	.13		30.0	128	14	0.7	
					14	59	27	1	60	5	28	7						
/ /61	5050				6.7	15	11	.5	60	3.3	25	5.5	.03	.0		78	0.5	
	5050		7.7	208	.33	1.23	.48	.01	1.20	.07	.71	.09		29.0	132	18	0.7	
					16	60	23	0	56	3	34	4						
07/30/62	5050	59 F			5.6	16	11	.6	62	5.0	24	4.8	.0	.0		78	0.5	
	5000	15 C	8.1	204	.28	1.32	.48	.02	1.24	.10	.68	.08		28.0	132	18	0.7	
					13	63	23	1	59	5	32	4						
	16N/01W-20Q01 H																	
04/30/53	5050	0 F			8.0	12	17	.8	50	6.7	28	13.0	.11	.2	135	69	0.9	
	5000	18 C	6.8	232	.40	.99	.74	.02	1.00	.14	.79	.21		19.0	135	20	1.0	
					19	46	34	1	47	7	37	10						
12/04/56	5050	49.0F			8.4	12	18	.7	52	6.7	30	18.0	.0	.0	145	71	0.9	
	5000	9.4C	6.7	239	.42	.99	.73	.02	1.04	.14	.85	.29		20.0	145	19	1.0	
					19	45	35	1	45	6	37	13						
12/05/57	5050	0 F			7.6	11	16	1.0	48	9.6	26	11.0	.0	.0	128	64	0.9	
	5000	18 C	7.9	215	.38	.90	.70	.03	.96	.20	.73	.18		17.0	128	16	0.9	
					19	45	35	1	46	10	35	9						

MINERAL ANALYSES OF GROUND WATER

F NORTH COAST HB
F-03 SMITH RIVER HU
F-03.A LOWER SMITH RIVER HA
F-03.A1 SMITH RIVER PLAIN HSA

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
					MINERAL CONSTITUENTS IN	MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE							MILLIGRAMS PER LITER					
	16N/01W-20Q02 H																	
06/03/86	5050	58.0F	7.0	250	6.0	16	18	.4	66	12	17	18.0	.1	--	146	81	0.9	
0900	5050	14.4C	8.3	235	.30	1.32	.79	.01	1.32	.25	.48	.29		--	127	15	1.1	
					12	55	32	0	56	11	21	12						
	16N/01W-21F01 H																	
06/04/86	5050	58.0F	6.1	340	4.0	11	43	1.6	30	12	73	5.1	.0	--	177	55	2.5	
1230	5050	14.4C	8.2	335	.20	.90	1.87	.04	.60	.25	2.06	.08		--	168	25	1.9	
					7	30	62	1	20	8	69	3						
	16N/01W-21M01 H																	
05/01/53	5050	0 F			7.8	6.7	12	.7	46	3.4	17	1.6	.04	.0	91	47	0.8	
	5000	18 C	7.3	149	.39	.55	.52	.02	.92	.07	.48	.03		14.0	91	1	0.7	
					26	37	35	1	61	5	32	2						
08/20/54	5050	57.0F			7.3	8.2	12	.4	46	4.5	21	1.2	--	.3	103	52	0.7	
	5000	13.9C	7.2	161	.36	.67	.52	.01	.92	.09	.59	.02		20.0	102	6	0.7	
					23	43	33	1	57	6	36	1						
12/04/56	5050	51.0F			5.6	11	13	.3	64	1.0	16	1.1	.02	.0	108	60	0.7	
	5000	10.5C	6.6	178	.28	.90	.57	.01	1.28	.02	.45	.02		22.0	108	0	0.8	
					16	51	32	1	72	1	25	1						
12/04/57	5050	0 F			4.8	11	14	.8	61	.0	18	1.2	.02	.0	110	56	0.8	
	5000	18 C	7.2	179	.24	.90	.61	.02	1.22	.00	.51	.02		24.0	110	0	0.9	
					14	51	34	1	70	0	29	1						
	16N/01W-22J04 H																	
06/04/86	5050	56.0F	6.7	83	2.0	4.0	9.0	.2	18	1.0	9.0	5.0	.0	--	52	22	0.8	
1305	5050	13.3C	8.2	86	.10	.33	.39	.01	.36	.02	.25	.08		--	41	4	0.2	T
					12	40	47	1	51	3	35	11						S
	16N/01W-22Q01 H																	
05/26/53	5050	0 F			4.6	2.9	11	.8	18	3.7	18	3.5	.09	.0	64	24	1.0	
	5000	18 C	6.8	109	.24	.24	.48	.02	.36	.08	.51	.06		8.6	64	6	0.2	
					24	24	49	2	36	8	50	6						

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP		FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	MINERAL CONSTITUENTS IN: MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE													MILLIGRAMS PER LITER					
	F			NORTH COAST HB															
	F-03			SMITH RIVER HU															
	F-03.A			LOWER SMITH RIVER HA															
	F-03.A1			SMITH RIVER PLAIN HSA															
	16N/01W-23D01 H																		
08/27/53	5050	59	F			3.4	4.1	4.5	.3	26	.7	7.2	1.8	--	--		25	0.4	
	5000	15	C	7.1	72	.17	.34	.20	.01	.52	.01	.20	.03		--	38	0	0.2	
						24	47	28	1	68	1	26	4						
	16N/01W-26D01 H																		
04/30/53	5050					4.0	6.4	18	.2	25	1.6	23	23.0	.06	.0		36	1.3	
	5000			6.6	154	.20	.53	.78	.01	.50	.03	.65	.37		10.0	101	12	0.7	
						13	35	51	1	32	2	42	24						
10/20/59	5050					18	14	18	.6	66	.0	32	34.0	.0	.1		101	0.8	
1145	5000			7.6	299	.90	1.15	.78	.02	1.32	.00	.90	.55		24.0	190	37	1.1	
						32	40	27	1	48	0	32	20						
09/ /60	5050					6.8	10	24	.4	26	.6	30	49.0	.04	.0		58	1.4	
1610	5050			6.5	275	.34	.82	1.04	.01	.52	.01	.85	.79		13.0	149	32	1.0	C
						15	37	47	0	24	0	39	36						
08/31/61	5050					8.0	13	30	.0	44	1.0	42	35.0	.0	.1		72	1.5	
0830	5050			7.7	304	.40	1.07	1.31	.00	.88	.02	1.18	.56		19.0	174	30	1.6	
						14	38	47		33	1	45	21						
07/17/62	5050					7.1	10	22	.0	31	2.0	39	23.0	.0	.0	144	60	1.2	
0900	5050			7.4	239	.35	.d2	.96	.00	.62	.04	1.10	.37		19.0	141	28	1.0	
						16	38	45		29	2	52	17						
	16N/01W-26E01 H																		
04/30/53	5050					31	6.7	12	1.0	104	3.3	14	4.3	.02	.0		105	0.5	
	5000			7.2	255	1.55	.55	.52	.03	2.08	.07	.39	.07		12.0	147	1	0.8	
						58	21	20	1	90	3	15	3						
	16N/01W-26M05 H																		
06/14/62	5050	55	F			2.7	1.8	8.0	.2	10	1.0	11	7.3	.04	.0		14	0.9	
	5050	13	C	6.3	77	.13	.15	.35	.01	.20	.02	.31	.12		9.0	47	4	0.2	
						20	23	55	2	31	3	48	18						

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB		TEMP	FIELD LABORATORY PH	EC	MINERAL CONSTITUENTS IN CA	MG	NA	K	MILLIGRAMS PER LITER MILLIEQUIVALENTS PER LITER PERCENT REACTANCE VALUE CACO3	SO4	CL	NO3	MILLIGRAMS PER LITER B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	F	NORTH COAST HB																	
	F-03	SMITH RIVER HU																	
	F-03.A	LOWER SMITH RIVER HA																	
	F-03.A1	SMITH RIVER PLAIN HSA																	
	16N/01W-26M09 H																		
06/02/86	5050		56.0F	6.8	160	5.0	8.0	12	.4	34	2.0	19	11.0	.0	--	100	46	0.8	
1540	5050		13.3C	8.6	154	.25	.66	.52	.01	.68	.04	.54	.18		--	78	12	0.6	T
						17	46	35	1	47	3	38	13						
	16N/01W-26N01 H																		
04/30/53	5050					17	5.5	22	1.3	85	3.6	18	3.9	.03	.3		65	1.2	
	5000			8.1	216	.85	.45	.96	.03	1.70	.07	.51	.06		15.0	137	0	1.5	
						37	20	42	1	73	3	22	3						
	16N/01W-34R01 H																		
06/02/86	5050		60.0F	7.1	320	9.0	9.0	37	2.5	73	4.0	46	.2	.0	--	192	60	2.1	
1345	5050		15.5C	8.3	303	.45	.74	1.61	.06	1.46	.08	1.30	.00		--	151	0	2.4	T
						16	26	56	2	51	3	46	0						
	16N/02W-13E01 H																		
09/23/53	5050					15	14	34	1.0	53	27	64	2.5	--	--		95	1.5	
	5000			6.7	380	.75	1.15	1.48	.03	1.06	.56	1.80	.04		--	189	42	1.8	
						22	34	43	1	31	16	52	1						
07/18/67	5050					59	11	34	.4	164	17	53	1.8	.0	--	237	192	1.1	
1230	5050			7.6	528	2.94	.90	1.48	.01	3.28	.35	1.49	.03		--	275	28	2.1	
						55	17	28	0	64	7	29	1						
07/10/68	5050		60 F	6.3	330	12	9.7	34	1.9	52	12	56	.0	.0	--	149	70	1.8	
1315	5050		16 C	7.7	320	.60	.80	1.48	.05	1.04	.25	1.58	.00		--	157	18	1.9	
						20	27	51	2	36	9	55	0						
08/28/69	0000		59.0F	6.1	355	--	--	--	--	--	--	--	--	--	--				
1300	5050		15.0C												--				S
06/24/70	5050		58 F	5.9	280	11	9.4	30	1.4	57	10	42	1.8	.0	--	157	66	1.6	
1430	5050		14 C	6.6	266	.55	.77	1.31	.04	1.14	.21	1.18	.03		--	140	9	1.8	
						21	29	49	1	45	8	46	1						
08/11/71	5050		61 F	6.1	325	--	--	--	--	--	--	--	--	--	--				
1630	0000		16 C												--				S
09/26/72	5050		58.0F	5.9	382	14	12	35	.8	60	14	58	1.3	.0	--	214	85	1.7	
1040	5050		14.4C	7.7	356	.70	.99	1.52	.02	1.20	.29	1.64	.02		--	171	25	2.0	T
						22	31	47	1	36	9	52	1						

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	MINERAL CONSTITUENTS IN CA	MG	NA	K	MILLIGRAMS PER LITER MILLIEQUIVALENTS PER LITER PERCENT REACTANCE VALUE CACO3	SO4	CL	NO3	MILLIGRAMS PER LITER B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	F	NORTH COAST HB																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.41	SMITH RIVER PLAIN HSA																
	16N/02W-13E01 H									CONTINUED								
09/24/73	5050	65.0F	6.5	560	50	18	38	.8	181	22	55	.7	.0	--	302	198	1.2	
1530	5050	18.3C	8.0	563	2.50	1.48	1.65	.02	3.62	.46	1.55	.01		--	293	18	2.4	
					44	26	29	0	64	8	27	0						
09/04/74	5050	71.0F	6.6	540	--	--	--	--	--	--	--	--	--	--				
1630	0000	21.6C												--				
09/10/75	5050	60.0F	6.7	445	--	--	--	--	--	--	--	--	--	--				
1650	0000	15.5C												--				
06/07/76	5050	56.0F	6.3	430	--	--	--	--	--	--	--	--	--	--				
1640	0000	13.3C												--				
08/10/77	5000	57.2F		400	30	18	31	1.0	110	19	61	.1	.02	.0		150	1.1	
	5000	14.0C		466	1.50	1.48	1.35	.03	2.20	.40	1.72	.00		22.0	248	39	1.9	
					34	34	31	1	51	9	40	0						
09/08/78	5050	59.0F	6.2	455	--	--	--	--	--	--	--	--	--	--				
1315	0000	14.4C												--				
09/13/79	5050	61.0F	6.3	420	--	--	--	--	--	--	--	--	--	--				
1150	0000	16.1C												--				
06/23/80	5050	61.0F	6.3	400	--	--	--	--	--	--	--	--	--	--				
1245	0000	16.1C												--				
09/28/81	5050	60.0F	6.2	320	13	13	30	.6	49	--	49	--	--	--		86	1.4	
1200	5050	15.5C	7.6	329	.65	1.07	1.31	.02	.98		1.38			--		37	1.6	
					21	35	43	1										S
08/04/82	5050		6.3	320	--	--	--	--	--	--	--	--	--	--				
0915	0000													--				
10/10/84	5050	59.0F	6.8	330	--	--	--	--	--	--	--	--	--	--				
1400	0000	15.0C												--				

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB		TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
		MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE (MINERAL CONSTITUENTS IN)														MILLIGRAMS PER LITER			
	F	NORTH COAST HB																	
	F-03	SMITH RIVER HU																	
	F-03.A	LOWER SMITH RIVER HA																	
	F-03.A1	SMITH RIVER PLAIN HSA																	
	16N/02W-13E01 H											CONTINUED							
09/17/85	5050		60 F	6.2	322	--	--	--	--	--	--	--	--	--	--				
0735	0000		16 C												--				
06/03/86	5050		57.0F	6.6	265	8.0	8.0	26	--	50	--	42	--	--	--		53	1.6	
0715	5050		13.9C	7.1	265	.40	.66	1.13		1.00		1.18			--		3	1.5	
						18	30	52											S
	17N/01W-02G01 H																		
09/15/58	5050					2.0	8.0	6.0	.0	16	5.0	9.0	2.0	.08	.0	64	40	0.4	
1510	5050			7.5	109	.10	.66	.26	.00	.32	.10	.25	.03		10.0	52	22	0.2	C
						10	65	25		46	14	36	4						S
08/27/59	5050					4.6	6.9	6.9	.2	40	1.4	7.1	3.0	.0	.0	72	40	0.5	
1330	5000			7.5	110	.23	.57	.30	.01	.80	.03	.20	.05		18.0	72	0	0.4	
						21	51	27	1	74	3	19	5						
09/ /60	5050					3.8	7.4	6.5	.3	38	2.1	7.5	3.5	.04	.0		40	0.4	
	5050			7.5	115	.19	.61	.28	.01	.76	.04	.21	.06		20.0	74	2	0.3	
						17	56	26	1	71	4	20	6						
09/30/61	5050					4.8	6.3	6.8	.2	39	1.2	7.8	4.2	.03	.1		38	0.5	
1655	5050			6.9	107	.24	.52	.30	.01	.78	.02	.22	.07		18.0	73	0	0.4	
						22	49	28	1	72	2	20	6						
09/12/63	5050					4.8	6.3	6.4	.4	36	.6	7.8	2.6	.0	--	74	38	0.5	
1400	5050			7.4	116	.24	.52	.28	.01	.72	.01	.22	.04		--	50	2	0.3	T
						23	50	27	1	73	1	22	4						
08/28/64	5050					--	--	6.8	--	38	--	7.0	--	--	--		40		
1705	5050			7.8	110			.30		.76		.20			--				
								27											S
06/24/65	5050					--	--	5.7	--	34	--	8.4	--	--	--		40		
1510	0000			7.9	113			.25		.68		.24			--				
								24											S
08/08/65	0000				118	--	--	--	--	--	--	--	--	--	--				
	0000														--				

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
					MINERAL CONSTITUENTS IN				MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE				MILLIGRAMS PER LITER					

F NORTH COAST HB
F-03 SMITH RIVER HU
F-03.A LOWER SMITH RIVER HA
F-03.A1 SMITH RIVER PLAIN HSA
17N/01W-02G01 H

CONTINUED

DATE TIME	SAMPLER LAB	TEMP	PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
07/17/67	5050	55.5F			--	--	6.2	--	--	--	7.4	--	.0	--		39		
1650	5050	13.0C	7.5	108			.27				.21			--				
							26											S
07/11/68	0000	55.0F	6.5	115	--	--	--	--	--	--	--	--	--	--				
0930	5050	12.8C												--				
03/28/69	0000	58.0F	6.1	115	--	--	--	--	--	--	--	--	--	--				
1205	5050	14.4C												--				
06/07/76	5050	55.0F	6.1	122	5.5	7.8	6.8	.2	37	1.8	7.4	12.0	.0	--	94	46	0.4	E
1550	5050	12.8C	7.9	121	.27	.64	.30	.01	.74	.04	.21	.19		--	64	9	0.3	T
					22	52	25	1	63	3	18	16						
08/10/77	5000	54.5F		101	5.7	8.3	7.0	.3	39	1.5	8.4	19.9	.01	.0		48	0.4	X
	5000	12.5C		142	.28	.68	.30	.01	.78	.03	.24	.32		19.0	93	9	0.4	
					22	54	24	1	57	2	18	23						
09/13/79	5050	57.0F	6.4	165	6.0	9.0	--	--	37	--	9.0	20.0	--	--		52		
1015	5050	13.9C	7.6	152	.30	.74			.74		.25	.32		--		15		
06/23/80	5050	57.0F	6.2	168	--	--	--	--	--	--	--	--	--	--				
1215	0000	13.9C												--				
																		S
08/05/82	5050		6.3	160	--	--	--	--	--	--	--	--	--	--				
1040	0000													--				
																		S
06/05/86	5050	55.0F	6.5	195	9.0	12	8.0	.5	36	5.0	11	38.0	.0	--	116	72	0.4	
0835	5050	12.8C	7.8	193	.45	.99	.35	.01	.72	.10	.31	.61		--	105	36	0.4	
					25	55	19	1	41	6	18	35						

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	F		NORTH COAST HB															
	F-03		SMITH RIVER HU															
	F-03.A		LOWER SMITH RIVER HA															
	F-03.A1		SMITH RIVER PLAIN HSA															
	17N/01W-02G02 H																	
03/19/87	2894				--	--	7.7	--	--	.0	11	40.0	--	--	128			E
	3334			164			.33			.00	.31	.65		--				
	17N/01W-02G03 H																	
10/14/86	2894				--	--	7.0	--	--	1.0	11	46.0	--	--	87			
	3334			140			.30			.02	.31	.74		--				
	17N/01W-02K01 H																	
06/03/86	2894				--	--	5.9	--	--	2.0	9.4	29.0	--	--	97			
	3334			156			.26			.04	.27	.47		--				
	17N/01W-02K02 H																	
06/03/86	2894				--	--	5.3	--	--	4.0	11	63.0	--	--	141			
	3334			226			.23			.08	.31	1.02		--				
	17N/01W-02K03 H																	
06/02/86	2894				--	--	6.4	--	--	.0	8.1	27.0	--	--	77			
	3334			124			.28			.00	.23	.44		--				
	17N/01W-02P01 H																	
08/27/53	5050				4.2	13	3.4	.3	64	1.5	5.8	1.9	--	--		64	0.2	
	5000		5.8	130	.21	1.07	.15	.01	1.28	.03	.16	.03		--	68	0	0.2	
					15	74	10	1	85	2	11	2						
	17N/01W-02P02 H																	
06/13/62	5050	56 F			6.5	20	4.6	.8	52	1.8	7.6	52.0	.05	.0		97	0.2	
	5050	13 C	7.5	223	.32	1.64	.21	.02	1.04	.04	.21	.84		20.0	145	46	0.3	
					15	75	10	1	49	2	10	39						

MINERAL ANALYSES OF GROUND WATER

F
F-03
F-03.A
F-03.A1
17N/01W-03E01 H

NORTH COAST HB
SMITH RIVER HU
LOWER SMITH RIVER HA
SMITH RIVER PLAIN HSA

DATE / TIME	SAMPLER / LAB	TEMP	FIELD / LABORATORY PH	FIELD / LABORATORY EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B / TURB	F / SIO2	TDS / SUM	TH / NCH	SAR / ASAR	REM
07/17/67	5050	57.0F			9.4	36	5.0	7.9	161	7.7	8.7	8.5	.0	--	169	172	0.2	
1550	5050	13.9C	8.1	358	.47	2.96	.22	.20	3.22	.16	.25	.14		--	180	11	0.3	
					12	77	6	5	85	4	7	4						
06/25/70	0000	56 F	6.8	340	--	--	--	--	--	--	--	--	--	--				
1015	5050	14 C												--				
08/12/71	5050	66 F	7.1	315	--	--	--	--	155	--	7.2	--	--	--		166		
0850	5050	19 C	8.1	335					3.10		.20			--				S
09/25/72	5050	56.0F	7.0	325	--	--	--	--	--	--	--	--	--	--				
0935	0000	13.3C												--				
09/24/73	5050	62.0F	7.1	345	--	--	--	--	--	--	--	--	--	--				
1220	0000	16.7C												--				
09/04/74	5050	60.0F	6.9	305	--	--	--	--	--	--	5.0	5.2	--	--		137		
1440	5050	15.5C		291							.14	.08		--				S
09/10/75	5050	57.0F	7.0	295	10	29	3.9	4.3	140	7.0	4.6	5.7	.0	--	167	144	0.1	
1430	5064	13.9C	8.3	293	.50	2.38	.17	.11	2.80	.15	.13	.09		--	148	4	0.3	
					16	75	5	3	88	5	4	3						
06/07/76	5050	56.0F	6.8	320	--	--	--	--	--	--	--	--	--	--				
1440	0000	13.3C												--				S
08/10/77	5000	55.4F		270	13	34	4.0	3.7	160	7.7	6.0	--	.02	.0		170	0.1	
	5000	13.0C		331	.65	2.80	.17	.09	3.20	.16	.17			34.0	198	13	0.3	
					16	75	5	2										S
09/08/78	5050	56.0F	7.0	320	--	--	--	--	--	--	--	--	--	--				
1000	0000	13.3C												--				
09/13/79	5050	64.0F	7.0	355	--	--	--	--	--	--	--	--	--	--				
0910	0000	17.8C												--				

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	MINERAL CONSTITUENTS IN CA	MG	NA	K	MILLIGRAMS PER LITER MILLIEQUIVALENTS PER LITER PERCENT REACTANCE VALUE CACO3	SO4	CL	NO3	MILLIGRAMS PER LITER B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	F	NORTH COAST HB																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.A1	SMITH RIVER PLAIN HSA																
	17N/01W-03E01 M										CONTINUED							
06/23/80	5050	60.0F	7.1	344	10	35	4.0	2.4	158	--	7.0	--	--	--		169	0.1	
1035	5050	15.5C	8.6	342	.50	2.88	.17	.06	3.16		.20			--		11	0.3	
					14	80	5	2										S
09/28/81	5050	61.0F	6.9	345	--	--	--	--	--	--	--	--	--	--				
1010	0000	16.1C												--				
																		S
08/04/82	5050		7.0	350	--	--	--	--	--	--	--	--	--	--				
0945	0000													--				
																		S
	17N/01W-04J01 M																	
11/29/56	5050	55 F			5.6	28	4.2	.3	124	1.9	7.0	2.1	.01	.0		128	0.2	
	5000	13 C	7.3	244	.28	2.30	.18	.01	2.49	.04	.20	.03		36.0	159	5	0.3	
					10	83	6	0	90	1	7	1						
09/12/57	5050				7.2	25	4.9	.5	119	.0	9.5	1.4	.00	.0		121	0.2	
	5000		8.1	242	.36	2.06	.21	.01	2.38	.00	.27	.02		34.0	154	2	0.3	
					14	78	8	0	89	0	10	1						
07/18/58	5050				4.0	28	6.0	.3	123	4.0	9.0	2.0	--	.0		124	0.2	
	5050		7.6	256	.20	2.30	.26	.01	2.46	.08	.25	.03		27.0	154	2	0.4	
					7	83	9	0	87	3	9	1						
09/03/59	5050				6.0	27	5.5	.3	127	2.0	6.0	1.4	.0	.0		126	0.2	
	5000		8.1	251	.30	2.22	.24	.01	2.54	.04	.17	.02		35.0	159	0	0.4	
					11	80	9	0	92	1	6	1						
09/14/60	5050				4.6	26	4.8	.4	123	2.3	7.1	1.9	.03	.0		129	0.2	
	5050		8.2	260	.23	2.30	.21	.01	2.46	.05	.20	.03		33.0	156	4	0.3	
					8	84	8	0	90	2	7	1						
08/30/61	5050				6.5	27	4.8	.4	122	.8	8.1	2.2	.04	.1		127	0.2	
	5050		7.7	250	.32	2.22	.21	.01	2.44	.02	.23	.04		34.0	157	5	0.3	
					12	80	8	0	89	1	8	1						
09/07/62	5050				6.0	26	4.7	.4	124	1.4	9.1	2.0	.0	.0		123	0.2	
	5000		8.2	240	.30	2.14	.20	.01	2.48	.03	.26	.03		34.0	158	0	0.3	
					11	81	8	0	89	1	9	1						S

MINERAL ANALYSES OF GROUND WATER

F
F-03
F-03.A
F-03.A1
17N/01W-04J01 H

NORTH COAST HB
SMITH RIVER HU
LOWER SMITH RIVER HA
SMITH RIVER PLAIN HSA

CONTINUED

DATE / TIME	SAMPLER / LAB	TEMP	FIELD / LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B / TURB	F / SIO2	TDS / SUM	TH / NCH	SAR / ASAR	REM
					MINERAL CONSTITUENTS IN				MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE				MILLIGRAMS PER LITER					
09/13/63	5050				5.9	28	4.4	.5	120	1.6	8.8	1.3	.1	--	142	128	0.2	
1300	5050		7.5	263	.29	2.30	.19	.01	2.40	.03	.25	.02		--	123	10	0.3	
					10	82	7	0	89	1	9	1						
08/18/64	5050				--	--	4.7	--	119	--	7.4	--	--	--		126		
1612	5050		8.2	244			.20		2.38		.21			--				
							7											S
08/26/65	5050				--	--	4.2	--	116	--	7.7	--	--	--		122		
1620	0000		7.6	251			.18		2.32		.22			--				
							7											S
08/08/66	0000			270	--	--	--	--	--	--	--	--	--	--				
	0000													--				
07/11/66	5050	55 F	7.3	280	4.8	30	3.8	1.1	131	4.3	8.0	3.2	.0	--	136	134	0.1	
1230	5050	13 C	8.1	281	.24	2.47	.17	.03	2.62	.09	.23	.05		--	134	5	0.3	
					6	95	6	1	89	3	8	2						
08/28/69	0000	57.0F	7.1	285	--	--	--	--	--	--	--	--	--	--				
1000	5050	13.9C												--				
09/04/74	5050	64.0F	6.9	320	7.5	34	4.4	.6	151	4.3	5.3	6.5	.0	--	172	158	0.2	
1420	5050	17.8C	8.0	305	.37	2.80	.19	.02	3.02	.09	.15	.10		--	153	8	0.3	
					11	83	6	1	90	3	4	3						
09/10/75	5050	58.0F	7.0	305	--	--	--	--	--	--	--	--	--	--				
1420	0000	14.4C												--				
																		S
08/10/77	5000	55.4F		260	7.9	34	4.3	.4	160	5.0	6.7	--	.02	.0		160	0.1	X
	5000	13.0C		326	.39	2.80	.19	.01	3.20	.10	.19			32.0	186	0	0.3	
					12	83	6	0										S
09/24/80	5050	60.8F	7.3	345	7.1	35	4.4	.6	160	2.3	7.1	5.8	.02	.1		160	0.2	
1230	5000	16.0C			.35	2.88	.19	.02	3.20	.05	.20	.09		32.0	190	2	0.3	
					10	84	5	1	90	1	6	3						

MINERAL ANALYSES OF GROUND WATER

DATE / TIME	SAMPLER / LAB	TEMP	FIELD / LABORATORY	PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B / TURB	F / SIO2	TDS / SUM	TH / NCH	SAR / ASAR	REM
						MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE								MILLIGRAMS PER LITER					
	F		NORTH COAST HB																
	F-03		SMITH RIVER HU																
	F-03.A		LOWER SMITH RIVER HA																
	F-03.A1		SMITH RIVER PLAIN HSA																
	17N/01W-04L01 H																		
08/27/53	5050	59	F			6.4	42	8.5	.1	187	.5	12	2.0	--	--		189	0.3	
	5000	15	C	7.1	363	.32	3.45	.37	.00	3.74	.01	.34	.03		--	184	2	0.6	
						8	83	9		91	0	8	1						
06/13/62	5050	58	F			11	53	8.0	.3	237	.8	14	1.5	.04	.1		245	0.2	
	5050	14	C	7.6	465	.55	4.36	.35	.01	4.74	.02	.39	.02		33.0	264	9	0.5	
						10	83	7	0	92	0	8	0						
	17N/01W-04L02 H																		
08/27/53	5050	67	F			6.0	43	7.0	.0	189	.7	9.5	.4	--	--		192	0.2	
	5000	19	C	7.0	352	.30	3.54	.30	.00	3.78	.01	.27	.01		--	180	3	0.5	
						7	86	7		93	0	7	0						
	17N/01W-04L03 H																		
06/04/86	5050	65.0F		7.3	520	6.0	58	8.0	.6	206	14	28	.5	.0	--	253	254	0.2	
1200	5050	18.3C		8.3	463	.30	4.77	.35	.02	4.12	.29	.79	.01		--	239	48	0.5	
						6	88	6	0	79	6	15	0						S
	17N/01W-09A01 H																		
09/03/59	5050					6.0	27	5.5	.3	127	2.0	6.0	1.4	.0	.0		126	0.2	
1300	5000			8.1	251	.30	2.22	.24	.01	2.54	.04	.17	.02		35.0	159	0	0.4	
						11	80	9	0	92	1	6	1						
09/14/60	5050					4.6	28	4.8	.4	123	2.3	7.1	1.9	.03	.0		129	0.2	
1530	5050			8.2	260	.23	2.30	.21	.01	2.46	.05	.20	.03		33.0	156	4	0.3	
						8	84	8	0	90	2	7	1						
08/30/61	5050					6.5	27	4.8	.4	122	.8	8.1	2.2	.04	.1		127	0.2	
1620	5050			7.7	250	.32	2.22	.21	.01	2.44	.02	.23	.04		34.0	157	5	0.3	
						12	80	8	0	89	1	8	1						
09/07/62	5050					6.0	26	4.7	.4	124	1.4	9.1	2.0	.0	.0	138	123	0.2	
1530	5050			8.2	240	.30	2.14	.20	.01	2.48	.03	.26	.03		34.0	158	0	0.3	
						11	81	8	0	89	1	9	1						S

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	MINERAL CONSTITUENTS IN CA	MG	NA	K	MILLIGRAMS PER LITER MILLIEQUIVALENTS PER LITER PERCENT REACTANCE VALUE CACO3	SO4	CL	NO3	MILLIGRAMS PER LITER B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	F	NORTH COAST HB																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.A1	SMITH RIVER PLAIN HSA																
	17N/01W-09B01 H																	
07/18/58	5050				4.0	28	6.0	.3	123	4.0	9.0	2.0	--	.0	194	124	0.2	E
1410	5050		7.6	256	.20	2.30	.26	.01	2.46	.08	.25	.03		27.0	154	2	0.4	T
					7	83	9	0	87	3	9	1						
	17N/01W-09G01 H																	
06/04/86	5050	56.0F	7.0	152	4.0	13	6.0	2.4	51	4.0	9.0	6.7	.0	--	90	64	0.3	
1050	5050	13.3C	8.3	153	.20	1.07	.26	.06	1.02	.08	.25	.11		--	76	13	0.3	
					13	67	16	4	70	5	17	8						S
	17N/01W-09K02 H																	
06/04/86	5050	59.0F	6.9	192	3.0	15	5.0	6.6	52	4.0	10	18.0	.0	--	108	69	0.3	
1055	5050	15.0C	8.2	178	.15	1.23	.22	.17	1.04	.08	.28	.29		--	93	17	0.3	
					8	69	12	10	62	5	17	17						
	17N/01W-11A02 H																	
09/ /60	5050	0 F			1.7	10	4.1	.1	33	.5	5.0	16.0	.03	.0	78	45	0.3	
	5000	18 C	7.4	117	.08	.82	.18	.00	.66	.01	.14	.26		21.0	78	12	0.2	
					7	76	17		62	1	13	24						
	17N/01W-11F01 H																	
07/30/53	5050	57 F			7.7	28	3.1	.3	123	--	5.8	--	--	--		134	0.1	
	5000	14 C	7.1	257	.38	2.30	.13	.01	2.46		.16			--		11	0.2	
					13	82	5	0										S
	17N/01W-13G01 H																	
08/27/53	5050				5.5	13	2.3	.2	65	1.7	4.8	1.2	--	--		67	0.1	
	5000		7.2	139	.27	1.07	.10	.01	1.30	.04	.14	.02		--	68	2	0.1	
					19	74	7	1	67	3	9	1						
	17N/01W-14C01 H																	
09/28/53	5050				21	19	20	2.1	152	10	8.5	3.3	--	--		130	0.8	
	5000		8.0	324	1.05	1.56	.87	.05	3.04	.21	.24	.05		--	175	0	1.4	
					30	44	25	1	86	6	7	1						
10/29/58	5050				16	11	47	2.6	153	13	27	.0	--	.4	284	91	2.1	E
1500	5050		8.0	370	.90	.90	2.04	.07	3.06	.27	.76	.00		16.0	227	0	3.5	T
					23	23	52	2	75	7	19	0						S
08/14/59	5050				21	15	3.9	3.3	165	15	14	.7	.1	.0		113	0.2	
0955	5000		8.4	367	1.05	1.23	.17	.08	3.30	.31	.39	.01		20.0	192	0	0.3	
					42	49	7	3	82	8	10	0						S

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
					MINERAL CONSTITUENTS IN				MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE				MILLIGRAMS PER LITER					
	F	NORTH COAST HB																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.A1	SMITH RIVER PLAIN HSA																
	17N/01W-14C01 H									CONTINUED								
09/15/60	5050				19	14	41	2.6	161	14	15	.6	.23	.1		105	1.7	
1500	5050		8.3	384	.95	1.15	1.78	.07	3.22	.29	.42	.01		20.0	223	0	3.0	
					24	29	45	2	82	7	11	0						
/ /61	5050				22	16	35	2.5	160	14	15	1.3	.18	.1		119	1.4	
	5050		8.1	364	1.10	1.32	1.52	.06	3.20	.29	.42	.02		22.0	224	0	2.5	
					28	33	38	2	81	7	11	1						
09/15/62	5050				25	13	35	2.9	174	13	15	.9	.1	.0	211	115	1.4	
1500	5050		8.3	367	1.25	1.07	1.52	.07	3.48	.27	.42	.01		23.0	232	0	2.6	
					32	27	39	2	83	6	10	0						S
07/10/63	5050				27	9.0	16	1.4	117	9.1	9.2	2.2	.1	.1	154	105	0.7	
1225	5050		8.2	251	1.35	.74	.70	.04	2.34	.19	.26	.04		24.0	168	0	1.1	
					48	26	25	1	83	7	9	1						
09/02/64	5050				--	--	30	--	159	--	14	--	--	--		122		
1210	5050		8.5	379			1.31		3.18		.39			--				
							35											S
	17N/01W-14C02 H																	
08/00/65	5050				3.8	19	5.4	.7	81	.5	9.0	2.8	.00	--	114	87	0.3	
1630	5050		7.4	192	.19	1.56	.23	.02	1.62	.01	.25	.05		--	90	7	0.4	T
					10	78	12	1	84	1	13	3						
08/08/66	0000			186	--	--	--	--	--	--	--	--	--	--				
	0000													--				
07/17/67	5050	67.0F			--	--	4.6	--	69	--	7.2	2.8	--	--		73		
1500	5050	19.4C	7.3	161			.20		1.38		.20	.05		--				
							12											S
07/11/68	5050	64 F	6.6	205	2.9	20	4.2	1.4	84	2.0	9.0	6.6	.0	--	100	89	0.2	
0745	5050	18 C	8.1	206	.14	1.64	.18	.04	1.68	.04	.25	.11		--	96	5	0.3	
					7	82	9	2	81	2	12	5						
08/28/69	0000	67.0F	6.5	178	--	--	--	--	--	--	--	--	--	--				
0915	5050	19.4C												--				

MINERAL ANALYSES OF GROUND WATER

F
F-03
F-03.A
F-03.A1
17N/01W-14C02 H

NORTH COAST HB
SMITH RIVER HU
LOWER SMITH RIVER HA
SMITH RIVER PLAIN HSA

CONTINUED

DATE TIME	SAMPLER LAB	TEMP	FIELD / LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
					MINERAL CONSTITUENTS IN				MILLIGRAMS PER LITER MILLIEQUIVALENTS PER LITER PERCENT REACTANCE VALUE				MILLIGRAMS PER LITER					
06/24/70 0940	0000 5050	60 F 16 C	6.3	190	--	--	--	--	--	--	--	--	--	-- --				
08/12/71 0845	5050 5050	59 F 15 C	6.3 7.3	170 172	--	--	--	--	75 1.50	--	7.9 .22	--	--	-- --		84		
09/25/72 1510	5050 0000	59.0F 15.0C	6.4	185	--	--	--	--	--	--	--	--	--	-- --				
09/24/73 1200	5050 0000		6.7	200	--	--	--	--	--	--	--	--	--	-- --				
09/04/74 1400	5050 0000	60.0F 15.5C	6.5	175	--	--	--	--	--	--	--	--	--	-- --				
09/10/75 1405	5050 0000	61.0F 16.1C	6.7	180	--	--	--	--	--	--	--	--	--	-- --				
06/07/76 1515	5050 0000	67.0F 19.4C	6.7	200	--	--	--	--	--	--	--	--	--	-- --				
08/10/77	5000 5000	57.2F 14.0C	- -	155 196	4.1 .20 10	19 1.56 79	4.6 .20 10	.8 .02 1	90 1.80 84	2.9 .06 3	7.5 .21 10	4.9 .08 4	.02	.0 27.0	 125	88 0	0.2 0.3	X S
09/08/78 0930	5050 5050	64.0F 17.3C	6.7 8.4	255 252	--	--	7.9 .34 13	--	118 2.36	--	7.7 .22	--	--	-- --		119		S
09/13/79 0850	5050 0000	67.0F 19.4C	6.7	240	--	--	--	--	--	--	--	--	--	-- --				S
05/23/80 1025	5050 5050	65.0F 18.3C	6.7 8.4	225 222	5.0 .25 11	21 1.73 77	6.0 .26 12	.8 .02 1	91 1.92	--	10 .28	--	--	-- --		99 8	0.3 0.4	S

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	MINERAL CONSTITUENTS IN CA	MG	NA	K	MILLIGRAMS PER LITER MILLIEQUIVALENTS PER LITER PERCENT REACTANCE VALUE CACO3	SO4	CL	NO3	MILLIGRAMS PER LITER B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	F	NORTH COAST HB																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.A1	SMITH RIVER PLAIN HSA																
	17N/01W-14C02 H										CONTINUED							
09/28/81	5050	61.0F	6.7	215	--	--	--	--	--	--	--	--	--	--				
0955	0000	16.1C												--				
																		S
08/04/82	5050		6.6	220	--	--	--	--	--	--	--	--	--	--				
0930	0000													--				
																		S
09/17/85	5050	59.0F	7.0	210	4.0	21	6.0	--	91	--	9.0	3.8	--	--		94	0.3	
0840	5050	15.0C	8.4	209	.20	1.73	.26		1.82		.25	.06		--		6	0.4	
					9	79	12											S
06/04/86	5050	59 F	7.0	202	--	--	--	--	--	--	--	--	--	--				
0725	0000	15 C												--				
																		S
	17N/01W-14F01 H																	
05/28/52	5050				9.6	9.5	6.0	.4	62	1.7	7.5	.3	.16	.0		63	0.3	
	5000		7.2	136	.48	.78	.26	.01	1.24	.04	.21	.00		24.0	96	1	0.4	
					31	51	17	1	83	3	14	0						
	17N/01W-14K04 H																	
06/04/86	5050	56.0F	7.0	195	8.0	13	11	.3	59	2.0	23	3.0	.0	--	113	74	0.6	
0825	5050	13.3C	8.0	195	.40	1.07	.48	.01	1.18	.04	.65	.05		--	96	15	0.7	
					20	55	24	1	61	2	34	3						
	17N/01W-14R02 H																	
06/05/86	5050	58.0F	7.0	290	12	27	9.0	.2	138	2.0	8.0	.4	.0	--	159	141	0.3	
0815	5050	14.4C	8.5	278	.60	2.22	.39	.01	2.76	.04	.23	.01		--	141	3	0.6	
					19	69	12	0	91	1	8	0						S
	17N/01W-15E01 H																	
07/30/53	5050				2.8	12	4.1	.3	49	--	8.5	--	--	--		56	0.2	
	5000		7.0	126	.14	.99	.18	.01	.98		.24			--		8	0.2	
					11	75	14	1										S

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
					MINERAL CONSTITUENTS IN				MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE				MILLIGRAMS PER LITER					
	F	NORTH COAST HB																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.A1	SMITH RIVER PLAIN HSA																
	17N/01W-15E02 H																	
11/29/56	5050	52.0F			3.2	13	5.8	.4	57	1.9	8.0	4.6	.04	.0	94	63	0.3	
	5000	11.1C	6.8	145	.16	1.07	.25	.01	1.14	.04	.23	.07		23.0	94	5	0.4	
					11	72	17	1	77	3	16	5						
09/14/57	5050	0 F			2.4	12	5.0	.5	53	.6	10	1.5	.0	.0	89	55	0.3	
	5000	18 C	7.8	130	.12	.99	.22	.01	1.06	.01	.28	.02		25.0	89	3	0.3	
					9	74	16	1	77	1	20	1						
06/25/58	5050				4.0	13	6.0	.3	59	2.0	9.0	2.0	.0	.0	104	65	0.3	E
1450	5050		8.2	146	.20	1.07	.26	.01	1.18	.04	.25	.03		14.0	86	5	0.4	
					13	69	17	1	79	3	17	2						
09/30/59	5050				2.8	13	5.5	.5	51	3.0	9.5	2.5	.0	.1		60	0.3	
1500	5000		7.5	136	.14	1.07	.24	.01	1.02	.06	.27	.04		30.0	97	10	0.3	
					10	73	16	1	73	4	19	3						
08/30/61	5050				5.0	12	4.2	.3	52	3.0	7.0	3.8	.04	.0		60	0.2	
1800	5050		7.7	136	.25	.99	.18	.01	1.04	.06	.20	.06		24.0	91	10	0.2	
					17	69	13	1	76	4	15	4						
	17N/01W-16F01 H																	
06/03/86	5050	58.0F	6.9	135	2.0	11	6.0	.5	36	5.0	9.0	12.0	.0	--	82	50	0.4	
1620	5050	14.4C	7.9	133	.10	.90	.26	.01	.72	.10	.25	.19		--	67	14	0.3	
					8	71	20	1	57	8	20	15						
	17N/01W-20H01 H																	
06/04/86	5050	64.0F	7.3	335	34	17	8.0	1.8	150	2.0	14	.4	.0	--	198	155	0.3	
0925	5050	17.8C	8.3	318	1.70	1.40	.35	.05	3.00	.04	.39	.01		--	167	5	0.5	
					49	40	10	1	87	1	11	0						
	17N/01W-20P01 H																	
07/08/53	5050				22	16	12	3.2	103	23	17	--	--	--		121	0.5	
	5000		7.5	292	1.10	1.32	.52	.08	2.06	.48	.48			--	155	18	0.8	
					36	44	17	3										S

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
					MINERAL CONSTITUENTS IN				MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE				MILLIGRAMS PER LITER					
	F NORTH COAST HB																	
	F-03 SMITH RIVER HU																	
	F-03.A LOWER SMITH RIVER HA																	
	F-03.A1 SMITH RIVER PLAIN HSA																	
	17N/01W-20P02 H																	
11/06/62	5050				34	41	33	36	221	31	61	39.0	.11	.3	496	254	0.9	
1700	5050		8.3	746	1.70	3.37	1.44	.92	4.42	.65	1.72	.63		38.0	446	33	2.0	
					23	45	19	12	60	9	23	8						
	17N/01W-22E06 H																	
06/03/86	5050	59.0F	6.7	125	4.0	10	6.0	.5	40	2.0	7.0	12.0	.0	--	82	51	0.4	
1545	5050	15.0C	7.9	122	.20	.82	.26	.01	.80	.04	.20	.19		--	65	11	0.3	T
					16	64	20	1	65	3	16	15						
	17N/01W-25E01 H																	
06/13/62	5050	54 F			18	10	19	1.0	108	.0	13	4.5	.15	.4		88	0.9	
	5050	12 C	7.7	248	.90	.82	.83	.03	2.16	.00	.37	.07		29.0	159	0	1.3	
					35	32	32	1	83	0	14	3						
	17N/01W-26R01 H																	
08/27/53	5050				26	7.3	9.4	.6	101	8.2	6.2	.2	--	--		95	0.4	
	5000		7.0	208	1.30	.60	.41	.02	2.02	.17	.17	.00		--	118	0	0.6	
					56	26	18	1	86	7	7	0						
	17N/01W-27G02 H																	
06/03/86	5050	61.5F	6.7	155	5.0	11	6.0	.2	45	3.0	14	3.8	.0	--	86	58	0.3	
1425	5050	16.4C	7.9	144	.25	.90	.26	.01	.90	.06	.39	.06		--	70	13	0.3	
					18	63	18	1	64	4	28	4						
	17N/01W-32M01 H																	
08/27/53	5050				6.8	8.0	4.1	.5	45	4.3	6.5	1.5	--	--		50	0.3	
	5000		6.7	117	.34	.66	.18	.01	.90	.09	.18	.02		--	59	5	0.2	
					29	55	15	1	76	8	15	2						
10/29/58	5050				7.0	14	7.0	1.9	70	5.0	11	.0	--	.0	124	75	0.4	E
1250	5050		7.9	170	.35	1.15	.30	.05	1.40	.10	.31	.00		17.0	105	5	0.4	
					19	62	16	3	77	6	17	0						
	17N/01W-34C01 H																	
05/27/52	5050				4.8	5.8	6.0	2.0	34	2.1	9.5	2.9	.0	.0		36	0.4	
	5000		6.9	103	.24	.48	.26	.05	.68	.04	.27	.05		16.0	69	2	0.3	
					23	47	25	5	65	4	26	5						

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB		TEMP	FIELD LABORATORY PH	EC	MINERAL CONSTITUENTS IN CA	MG	NA	K	MILLIGRAMS PER LITER MILLIEQUIVALENTS PER LITER PERCENT REACTANCE VALUE CACO3	SO4	CL	NO3	MILLIGRAMS PER LITER B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	F	NORTH COAST HB																	
	F-03	SMITH RIVER HU																	
	F-03.A	LOWER SMITH RIVER HA																	
	F-03.A1	SMITH RIVER PLAIN HSA																	
	17N/01W-34G01 H																		
06/14/55	5050		55 F			7.4	8.3	5.7	.6	37	7.4	8.0	14.0	.0	.0		53	0.3	
	5000		13 C	6.8	134	.37	.68	.25	.02	.74	.15	.23	.23		16.0	90	16	0.3	
						28	52	19	2	55	11	17	17						
	17N/01W-34G03 H																		
06/03/86	5050		62.0F	6.6	102	4.0	8.0	4.0	.0	36	3.0	7.0	2.4	.0	--	67	43	0.3	
1350	5050		16.7C	7.9	101	.20	.66	.17	.00	.72	.06	.20	.04		--	50	7	0.2	T
						19	64	17		71	6	20	4						
	17N/01W-35K01 H																		
06/05/86	5050		67.0F	7.3	470	24	33	23	1.0	179	6.0	32	7.7	.0	--	258	196	0.7	
0730	5050		19.4C	8.5	440	1.20	2.71	1.00	.03	3.58	.12	.90	.12		--	234	17	1.5	
						24	55	20	1	76	3	19	3						S
	18N/01W-17R01 H																		
11/29/56	5050		54 F			11	13	14	.2	93	.0	16	.1	.12	.0		81	0.7	
	5000		12 C	7.0	215	.55	1.07	.61	.01	1.86	.00	.45	.00		33.0	143	0	1.0	
						25	48	27	0	81	0	19	0						
12/04/57	5050					8.4	8.9	9.5	.5	59	1.9	13	.3	.03	.0		57	0.5	
	5000			7.6	154	.42	.73	.41	.01	1.18	.04	.37	.00		29.0	107	0	0.6	
						27	46	26	1	74	3	23	0						
10/ /59	5050					14	14	20	.5	114	.0	16	.3	.0	.0		93	0.9	
	5050			7.7	254	.70	1.15	.87	.01	2.28	.00	.45	.00		17.0	150	0	1.4	
						26	42	32	0	84	0	16	0						
10/ /59	5050					14	14	20	.5	114	.0	16	.3	.0	.0		93	0.9	
1200	5000			7.7	254	.70	1.15	.87	.01	2.28	.00	.45	.00		17.0	150	0	1.4	
						26	42	32	0	84	0	16	0						
/ /61	5050					16	7.8	18	.5	89	1.0	13	.4	.09	.1		72	0.9	
	5050			7.0	213	.80	.64	.78	.01	1.78	.02	.37	.01		35.0	145	0	1.2	
						36	29	35	0	82	1	17	0						
08/30/61	5050					16	7.8	18	.5	89	.1	13	.4	.09	.1		72	0.9	
	5050			7.0	213	.80	.64	.78	.01	1.78	.00	.37	.01		35.0	144	0	1.2	
						36	29	35	0	82	0	17	0						
09/17/62	5050					12	12	15	.6	95	1.0	15	1.2	.0	.0	137	80	0.7	
	5050			8.3	215	.60	.99	.65	.02	1.90	.02	.42	.02		34.0	148	0	1.0	
						27	44	29	1	81	1	18	1						

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	MINERAL CONSTITUENTS IN CA	MG	NA	K	MILLIGRAMS PER LITER MILLIEQUIVALENTS PER LITER PERCENT REACTANCE VALUE CACO3	SO4	CL	NO3	MILLIGRAMS PER LITER B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	F		NORTH COAST HB															
	F-03		SMITH RIVER HU															
	F-03.A		LOWER SMITH RIVER HA															
	F-03.A1		SMITH RIVER PLAIN HSA															
	18N/01W-17R01 H										CONTINUED							
08/28/64	5050				--	--	19	--	107	--	15	--	--	--		94		
1645	5050		7.9	250			.78		2.14		.42			--				
							29											S
09/10/65	5050				17	9.8	15	.7	92	.0	16	1.0	.00	--	140	83	0.7	
1505	0000		8.3	228	.85	.81	.65	.02	1.64	.00	.45	.02		--	115	0	1.0	
					36	35	28	1	80	0	19	1						
08/09/66	0000			215	--	--	--	--	--	--	--	--	--	--				
	0000													--				
07/18/67	5050				--	--	13	--	85	--	18	1.6	--	--		87		
0810	5050		8.0	226			.57		1.70		.51	.03		--				
							25											S
	18N/01W-17R02 H																	
10/29/58	5050				11	13	12	.0	85	.0	17	.0	.0	.2	149	82	0.6	E
1530	5050		7.8	212	.55	1.07	.52	.00	1.70	.00	.48	.00		30.0	134	0	0.8	
					26	50	24		78	0	22	0						
08/27/59	5050				11	13	12	.1	89	.6	13	.1	.0	.0		81	0.6	
1500	5000		7.9	203	.55	1.07	.52	.00	1.78	.01	.37	.00		34.0	137	0	0.8	
					26	50	24		82	0	17	0						
/ /61	5050				24	2.9	18	.5	89	1.3	13	1.0	.09	.1		72	0.9	
	5050		7.4	211	1.20	.24	.78	.01	1.78	.03	.37	.02		34.0	148	0	1.2	
					54	11	35	0	81	1	17	1						
07/10/63	5050	76.0F			14	10	11	.2	84	.0	11	.0	.0	.2	116	75	0.6	
0935	5050	24.4C	8.0	192	.70	.82	.48	.01	1.68	.00	.31	.00		23.0	120	0	0.7	
					35	41	24	0	84	0	16	0						
08/28/64	5050				--	--	12	--	98	--	14	--	--	--		95		
1640	5050		6.1	229			.52		1.96		.39			--				
							21											S

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
					MINERAL CONSTITUENTS IN				MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE				MILLIGRAMS PER LITER					
	F	NORTH COAST HB																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.A1	SMITH RIVER PLAIN HSA																
	18N/01W-17R04 H																	
08/27/69	5050	69.0F	7.1	285	18	16	15	.4	110	1.6	18	.3	.0	--	162	110	0.6	
1600	5050	20.5C	7.7	270	.90	1.32	.65	.01	2.20	.03	.51	.00		--	135	1	1.0	
					31	46	23	0	80	1	19	0						
06/24/70	0000	62 F	7.0	278	--	--	--	--	--	--	--	--	--	--				
1635	5050	17 C												--				
																		S
09/11/71	5050	64 F	7.1	279	--	--	--	--	--	--	--	--	--	--				
1440	0000	18 C												--				
																		S
09/26/72	5050	58.0F	6.8	320	16	20	14	.4	107	5.1	24	.2	.0	--	190	122	0.6	
0820	5050	14.4C	7.5	298	.80	1.64	.61	.01	2.14	.11	.68	.00		--	144	15	0.9	T
					26	54	20	0	73	4	23	0						
09/24/73	5050	63.0F	6.8	300	--	--	--	--	--	--	--	--	--	--				
1400	0000	17.2C												--				
																		S
	18N/01W-23M02 H																	
06/04/86	2894				--	--	10	--	--	.0	15	66.0	--	--	99			
	3334			159			.44			.00	.42	1.06		--				
	18N/01W-25N01 H																	
08/21/52	5050				4.8	1.7	5.0	.6	17	6.4	8.0	1.1	.1	.0		19	0.5	
	5050		6.6	58	.24	.14	.22	.02	.34	.13	.23	.02		10.0	48	2	0.1	
					39	23	35	3	47	18	32	3						
	18N/01W-26D01 H																	
11/28/56	5050	54.0F			2.8	3.2	6.8	.2	20	1.0	6.5	6.5	.07	.0	53	20	0.7	E
	5000	12.2C	6.4	66	.14	.26	.30	.01	.40	.02	.18	.10		14.0	53	0	0.1	
					20	37	42	1	57	3	26	14						
10/02/57	5050	0 F			2.8	2.7	9.2	.6	21	1.9	7.5	6.5	.01	.0	57	18	0.9	
	5000	18 C	6.7	84	.14	.22	.40	.02	.42	.04	.21	.10		13.0	57	0	0.2	
					18	28	51	3	55	5	27	13						
09/04/58	5050				1.0	3.0	7.0	.3	14	1.0	7.0	7.0	--	.0	44	14	0.8	
1630	5050		7.7	66	.05	.25	.30	.01	.28	.02	.20	.11		16.0	51	1	0.1	
					8	41	49	2	46	3	33	18						

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	MINERAL CONSTITUENTS IN CA	MG	NA	K	MILLIGRAMS PER LITER MILLIEQUIVALENTS PER LITER PERCENT REACTANCE VALUE CACO3	SO4	CL	NO3	MILLIGRAMS PER LITER B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	F	NORTH COAST HB																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.A1	SMITH RIVER PLAIN HSA																
	18N/01W-26D01 H										CONTINUED							
08/30/61	5050				5.5	3.8	6.3	.3	8	1.6	9.0	26.0	.06	.0		29	0.5	
1650	5050		6.1	101	.27	.31	.27	.01	.16	.03	.25	.42		12.0	69	21	0.0	
					31	36	31	1	19	3	29	49						
01/19/87	2894				--	--	7.0	--	--	4.0	8.0	22.0	--	--	66			
	3334			105			.30			.08	.23	.35		--				
	18N/01W-26D02 H																	
08/30/61	5050				5.5	3.8	6.3	.3	8	1.6	9.0	26.0	.06	.0		29	0.5	
	5050		6.1	101	.27	.31	.27	.01	.16	.03	.25	.42		12.0	69	21	0.0	
					31	36	31	1	19	3	29	49						
09/15/62	5050				6.8	4.9	8.2	.5	7	.6	10	42.0	.1	.0	100	37	0.6	E
1500	5050		7.0	124	.34	.40	.36	.01	.14	.01	.28	.68		11.0	88	30	0.0	
					31	36	32	1	13	1	25	61						
	18N/01W-26D03 H																	
10/12/86	2894				--	--	5.0	--	--	3.0	7.1	8.9	--	--	42			
	3334			72			.22			.06	.20	.14		--				
	18N/01W-26F01 H																	
01/15/86	2894				--	--	10	--	--	4.0	8.4	22.0	--	--	84			
	3334			135			.44			.08	.24	.35		--				
	18N/01W-26H01 H																	
07/18/67	5050	59.5F			4.6	6.2	4.0	.0	36	4.8	4.5	.0	.0	--	27	37	0.3	E
0700	5050	15.3C	7.4	92	.23	.51	.17	.00	.72	.10	.13	.00		--	46	1	0.2	T
					25	56	19		76	11	14	0						
07/11/68	0000	60 F	6.6	95	--	--	--	--	--	--	--	--	--	--				
1030	5050	16 C												--				
08/26/69	0000	65.0F	6.3	102	--	--	--	--	--	--	--	--	--	--				
1135	5050	18.3C												--				
06/25/73	5050	58 F	6.1	83	--	--	--	--	33	--	4.1	--	--	--		34		
0910	5050	14 C	7.4	85					.66		.12			--				

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MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	F	NORTH COAST HR																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.A1	SMITH RIVER PLAIN HSA									CONTINUED							
	18N/01W-26H01 H																	
08/05/82	5050		6.4	170	--	--	--	--	--	--	--	--	--	--				
0945	0000													--				
	18N/01W-26K01 H																	
06/04/86	2894				--	--	6.3	--	--	5.0	8.8	22.0	--	--	59			
	3334			95			.27			.10	.25	.35		--				
	18N/01W-25K02 H																	
03/19/87	2894				--	--	5.9	--	--	6.0	7.2	24.0	--	--	81			E
	3334			99			.26			.12	.20	.39		--				
	18N/01W-26K03 H																	
06/04/86	2894				--	--	5.5	--	--	4.0	6.8	2.7	--	--	54			
	3334			86			.24			.08	.19	.04		--				
	18N/01W-26L01 H																	
06/04/86	2894				--	--	4.1	--	--	3.0	5.0	.9	--	--	59			
	3334			95			.18			.06	.14	.01		--				
	18N/01W-26L03 H																	
01/19/87	2894				--	--	3.0	--	--	2.0	5.0	1.8	--	--	48			
	3334			77			.13			.04	.14	.03		--				
	18N/01W-26P02 H																	
03/19/87	2894				--	--	6.7	--	--	5.0	7.5	30.0	--	--	86			E
	3334			111			.29			.10	.21	.48		--				

Header notes: MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE (mineral constituents); MILLIGRAMS PER LITER (B, F, TDS, TH, SAR).

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
					MINERAL CONSTITUENTS IN				MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE				MILLIGRAMS PER LITER					
	F F-03 F-03.A F-03.A1 18N/01W-26H01 H	NORTH COAST HB SMITH RIVER HU LOWER SMITH RIVER HA SMITH RIVER PLAIN HSA									CONTINUED							
08/11/71	5050	64 F	6.5	80	--	--	--	--	--	--	--	--	--	--				
1300	0000	18 C												--				
09/26/72	5050	62.0F	6.1	120	--	--	4.5	--	43	--	6.8	--	--	--		45		
0755	5050	16.7C	7.1	111			.20		.86		.19			--				
							18											S
09/24/73	5050	62.0F	6.3	125	--	--	--	--	--	--	--	--	--	--				
1440	0000	16.7C												--				
																		S
09/04/74	5050	62.0F	6.3	105	--	--	--	--	--	--	--	--	--	--				
1510	0000	16.7C												--				
																		S
09/10/75	5050	67.0F	6.6	100	--	--	--	--	--	--	--	--	--	--				
1510	0000	19.4C												--				
																		S
06/07/76	5050	55.0F	6.5	80	--	--	--	--	--	--	--	--	--	--				
1510	0000	12.8C												--				
																		S
08/10/77	5000	59.0F		100	6.9	6.3	4.4	.5	44	3.3	4.4	1.4	.02	.0		43	0.3	
	5000	15.0C		111	.34	.52	.19	.01	.88	.07	.12	.02		13.0	67	0	0.2	
					32	49	18	1	81	6	11	2						
09/08/78	5050	62.0F	6.4	110	--	--	--	--	--	--	--	--	--	--				
1230	0000	16.7C												--				
09/13/79	5050	64.0F	6.3	120	--	--	--	--	--	--	--	--	--	--				
0940	0000	17.8C												--				
06/23/80	5050	58.0F	6.7	116	--	--	--	--	--	--	--	--	--	--				
1100	0000	14.4C												--				
09/28/81	5050	61.0F	6.2	160	10	11	6.0	.7	70	--	7.0	--	--	--		70	0.3	
1045	5050	16.1C	7.9	166	.50	.90	.26	.02	1.40		.20			--		0	0.4	
					30	54	15	1										S

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	MINERAL CONSTITUENTS IN CA	MG	NA	K	CACO3	MILLIGRAMS PER LITER MILLIEQUIVALENTS PER LITER PERCENT REACTANCE VALUE SO4	CL	NO3	MILLIGRAMS PER LITER B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	F	NORTH COAST HB																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.A1	SMITH RIVER PLAIN HSA																
	18N/01W-26P03 H																	
03/19/87	2894				--	--	5.5	--	--	10	6.1	27.0	--	--	90			E
	3334			105			.24			.21	.17	.44		--				
	18N/01W-26Q02 H																	
04/15/87	2894				--	--	6.6	--	--	5.0	9.3	36.0	--	--	126			E
	3334			112			.29			.10	.26	.58		--				
	18N/01W-26Q05 H																	
06/04/86	2894				--	--	8.8	--	--	1.0	8.2	30.0	--	--	77			
	3334			124			.38			.02	.23	.48		--				
	18N/01W-26R02 H																	
06/03/86	2894				--	--	6.1	--	--	1.0	8.2	24.0	--	--	55			
	3334			88			.27			.02	.23	.39		--				
	18N/01W-26R03 H																	
06/04/86	2894				--	--	8.5	--	--	1.0	7.6	15.0	--	--	71			
	3334			113			.37			.02	.21	.24		--				
	18N/01W-27B01 H																	
03/19/87	2894				--	--	6.2	--	--	6.0	11	45.0	--	--	107			E
	3334			133			.27			.12	.31	.73		--				
	18N/01W-27F01 H																	
07/30/53	5050				3.6	2.8	5.0	.3	14	--	7.2	--	--	--		20	0.5	
	5000		6.0	72	.18	.23	.22	.01	.28		.20			--		7	0.0	
					28	36	34	2										S
06/12/62	5050	56 F			5.7	2.7	5.1	.4	11	.3	7.3	17.0	.05	.0		25	0.4	
	5050	13 C	6.4	84	.28	.22	.22	.01	.22	.01	.21	.27		11.0	56	14	0.0	
					38	30	30	1	31	1	30	38						

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
					MINERAL CONSTITUENTS IN				MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE				MILLIGRAMS PER LITER					
	F	NORTH COAST HB																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.A1	SMITH RIVER PLAIN HSA																
	18N/01W-27K01 H																	
08/13/86	2894				--	--	5.3	--	--	6.0	7.7	17.0	--	--	82			
	3334			131			.23			.12	.22	.27		--				
	18N/01W-27P03 H																	
01/19/87	2894				--	--	30	--	--	28	120	41.0	--	--	282			
	3334			451			1.31			.58	3.38	.66		--				
	18N/01W-34M00 H																	
08/10/77	5000	55.4F		250	13	34	3.2	.7	160	19	5.0	9.2	.01	.0		170	0.1	X
	5000	13.0C		316	.65	2.80	.14	.02	3.20	.40	.14	.15		34.0	214	13	0.2	
					18	78	4	1	82	10	4	4						S
	18N/01W-34M02 H																	
07/30/53	5050	56 F			11	36	3.4	.5	171	--	6.2	--	--	--		176	0.1	
	5000	13 C	7.2	332	.55	2.96	.15	.01	3.42		.17			--		5	0.2	
					15	81	4	0										S
08/20/54	5050	56 F			8.9	39	3.2	.5	177	6.6	6.0	3.2	.05	.1		184	0.1	
	5000	13 C	8.0	341	.44	3.21	.14	.01	3.54	.14	.17	.05		38.0	212	6	0.2	
					12	84	4	0	91	4	4	1						
08/11/58	5050				13	39	4.0	.7	184	.0	9.0	6.0	--	.0	274	190	0.1	E
	5050		8.3	348	.65	3.21	.17	.02	3.68	.00	.25	.10		20.0	202	9	0.3	T
					16	79	4	0	91	0	6	2						
09/03/59	5050				12	36	4.3	.7	173	4.0	4.0	5.1	.0	.0		178	0.1	
1340	5000		8.3	329	.60	2.96	.19	.02	3.46	.08	.11	.08		37.0	207	5	0.3	
					16	79	5	1	93	2	3	2						
09/ /60	5050				13	42	3.9	.7	194	4.6	5.0	4.7	.05	.0		205	0.1	
	5050		8.4	381	.65	3.45	.17	.02	3.68	.10	.14	.08		39.0	229	11	0.2	
					15	80	4	0	92	2	3	2						
08/30/61	5050				15	37	3.8	.8	182	4.0	5.8	5.3	.07	.0		191	0.1	
1640	5050		7.6	356	.75	3.04	.17	.02	3.64	.08	.16	.09		40.0	221	8	0.2	
					19	76	4	1	92	2	4	2						
09/07/62	5050				14	36	3.7	.8	182	5.0	6.7	5.1	.0	.0	192	184	0.1	
1500	5050		8.2	343	.70	2.96	.16	.02	3.64	.10	.19	.08		37.0	217	1	0.2	
					13	77	4	1	91	2	5	2						S

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
					MINERAL CONSTITUENTS IN				MILLIGRAMS PER LITER / MILLIEQUIVALENTS PER LITER / PERCENT REACTANCE VALUE				MILLIGRAMS PER LITER					
	F	NORTH COAST HB																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.A1	SMITH RIVER PLAIN HSA																
	18N/01W-34M02 H										CONTINUED							
07/10/63	5050				22	35	3.9	.8	186	4.8	6.1	8.3	.0	.1	226	198	0.1	
1205	5050		8.3	405	1.10	2.88	.17	.02	3.76	.10	.17	.13		33.0	227	11	0.3	
					26	69	4	0	90	2	4	3						
08/28/64	5050				--	--	3.6	--	189	--	8.8	--	--	--		215		
1445	5050		8.0	400			.16		3.78		.25			--				
							4											S
08/10/66	5050				--	2.7	--	--	174	--	6.7	--	--	--		191		
1000	5050		7.0	374		.22			3.48		.19			--				
																		S
07/17/67	5050	59.0F			--	--	--	--	--	--	--	--	--	--				
1615	5050	15.0C		404										--				
07/11/68	5050	56 F	7.0	380	13	40	4.0	--	--	--	5.2	--	--	--		200	0.0	
0830	5050	13 C	8.6	394	.65	3.35	.17				.15			--				
					9	45	2											S
08/28/69	5050	64.0F	7.0	370	15	37	4.2	1.1	177	6.7	5.8	4.3	.0	--	199	189	0.1	
1030	5050	17.8C	7.6	363	.75	3.04	.18	.03	3.54	.14	.16	.07		--	180	13	0.3	
					19	76	5	1	91	4	4	2						
06/25/70	0000	57 F	6.6	340	--	--	--	--	--	--	--	--	--	--				
1000	5050	14 C												--				
																		S
08/12/71	5050	58 F	6.8	325	--	--	--	--	--	--	--	--	--	--				
0830	0000	14 C												--				
																		S
09/26/72	5050	57.0F	6.8	355	--	--	--	--	--	--	--	--	--	--				
0920	0000	13.9C												--				
																		S
09/24/73	5050	58.0F	6.8	320	11	33	3.0	.6	154	6.2	4.8	12.0	.0	--	169	165	0.1	
1255	5050	14.4C	6.1	315	.55	2.71	.13	.02	3.08	.13	.14	.19		--	163	9	0.2	
					16	79	4	1	87	4	4	5						
09/04/74	5050	56.0F	6.8	319	--	--	--	--	--	--	--	--	--	--				
1450	0000	14.4C												--				
																		S

MINERAL ANALYSES OF GROUND WATER

F — NORTH COAST HB
F-03 — SMITH RIVER HU
F-03.A — LOWER SMITH RIVER HA
F-03.A1 — SMITH RIVER PLAIN HSA
1BN/01W-34M02 H

CONTINUED

DATE / TIME	SAMPLER / LAB	TEMP	FIELD / LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B / TURB	F / SIO2	TDS / SUM	TH / NCH	SAR / ASAR	REM
07/10/63	5050				22	35	3.9	.8	186	4.8	6.1	8.3	.0	.1	226	198	0.1	
1205	5050		8.3	405	1.10	2.88	.17	.02	3.76	.10	.17	.13		33.0	227	11	0.3	
					26	69	4	0	90	2	4	3						
08/28/64	5050				--	--	3.6	--	189	--	8.8	--	--	--		215		
1445	5050		8.0	400			.16		3.78		.25			--				
							4											S
08/10/66	5050				--	2.7	--	--	174	--	6.7	--	--	--		191		
1000	5050		7.0	374		.22			3.48		.19			--				
																		S
07/17/67	5050	59.0F			--	--	--	--	--	--	--	--	--	--				
1615	5050	15.0C		404										--				
07/11/68	5050	56 F	7.0	380	13	40	4.0	--	--	--	5.2	--	--	--		200	0.0	
0830	5050	13 C	8.6	394	.65	3.35	.17				.15			--				
					9	45	2											S
08/28/69	5050	64.0F	7.0	370	15	37	4.2	1.1	177	6.7	5.8	4.3	.0	--	199	189	0.1	
1030	5050	17.8C	7.6	363	.75	3.04	.18	.03	3.54	.14	.16	.07		--	180	13	0.3	
					19	76	5	1	91	4	4	2						
06/25/70	0000	57 F	6.6	340	--	--	--	--	--	--	--	--	--	--				
1000	5050	14 C												--				
																		S
08/12/71	5050	58 F	6.8	325	--	--	--	--	--	--	--	--	--	--				
0830	0000	14 C												--				
																		S
09/26/72	5050	57.0F	6.8	355	--	--	--	--	--	--	--	--	--	--				
0920	0000	13.9C												--				
																		S
09/24/73	5050	58.0F	6.8	320	11	33	3.0	.6	154	6.2	4.8	12.0	.0	--	169	165	0.1	
1255	5050	14.4C	6.1	315	.55	2.71	.13	.02	3.08	.13	.14	.19		--	163	9	0.2	
					16	79	4	1	87	4	4	5						
09/04/74	5050	58.0F	6.8	319	--	--	--	--	--	--	--	--	--	--				
1450	0000	14.4C												--				
																		S

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	F	NORTH COAST HB																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.41	SMITH RIVER PLAIN HSA																
	18N/01W-34M02 H										CONTINUED							
09/10/75	5050	59.0F	6.8	295	--	--	--	--	--	--	--	--	--	--				
1445	0000	15.0C												--				
																		S
06/07/76	5050	56.0F	6.8	300	--	--	--	--	--	--	--	--	--	--				
1450	0000	13.3C												--				
																		S
08/10/77	5000	59.0F		230	11	28	3.1	.7	130	13	5.4	6.6	.02	.1		140	0.1	
	5000	15.0C		277	.55	2.30	.13	.02	2.60	.27	.15	.11		33.0	179	13	0.2	
					18	77	4	1	83	9	5	4						
09/08/78	5050	59.0F	6.8	330	--	--	--	--	--	--	--	--	--	--				
1015	0000	15.0C												--				
09/13/79	5050	60.0F	6.9	340	--	--	--	--	--	--	--	--	--	--				
0920	0000	15.5C												--				
06/23/80	5050	57.0F	7.0	346	--	--	--	--	--	--	--	--	--	--				
1045	0000	13.9C												--				
09/28/81	5050	58.0F	6.9	333	--	--	--	--	--	--	--	--	--	--				
1020	0000	14.4C												--				
08/04/82	5050	59.0F	6.9	340	12	35	4.0	.7	151	--	6.0	--	--	--		174	0.1	
0955	5050	15.0C	8.6	341	.60	2.88	.17	.02	3.02		.17			--		23	0.3	
					16	78	5	1										S
09/17/85	5050	58 F	7.0	395	--	--	--	--	--	--	--	--	--	--				
0920	0000	14 C												--				
06/04/86	5050	56.0F	7.0	470	15	53	4.0	1.2	214	14	8.0	16.0	.0	--	253	256	0.1	
1025	5050	13.3C	8.6	447	.75	4.36	.17	.03	4.28	.29	.23	.26		--	240	42	0.2	
					14	82	3	1	85	6	5	5						S

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	EC	MINERAL CONSTITUENTS IN CA	MG	NA	K	MILLIGRAMS PER LITER MILLIEQUIVALENTS PER LITER PERCENT REACTANCE VALUE CACO3	SO4	CL	NO3	B TURB	MILLIGRAMS PER LITER F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	F	NORTH COAST HB																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.A1	SMITH RIVER PLAIN HSA																
	18N/01W-35B01 H																	
11/28/56	5050	54.0F			4.4	2.4	5.9	.2	22	1.9	6.0	2.0	.05	.0	50	21	0.6	E
	5000	12.2C	7.0	69	.22	.20	.26	.01	.44	.04	.17	.03		14.0	50	0	0.1	
					32	29	38	1	65	6	25	4						
09/13/57	5050	0 F			5.2	2.2	6.5	.6	21	1.0	7.4	5.4	.00	.0	57	22	0.6	E
	5000	18 C	7.0	78	.26	.18	.28	.02	.42	.02	.21	.09		17.0	58	1	0.2	
					35	24	38	3	57	3	28	12						
	18N/01W-35B02 H																	
11/28/56	5050	54 F			4.4	2.4	5.9	.2	22	1.9	6.0	2.0	.05	.0		21	0.6	
	5000	12 C	7.0	69	.22	.20	.26	.01	.44	.04	.17	.03		14.0	50	0	0.1	
					32	29	38	1	65	6	25	4						
09/13/57	5050				5.2	2.2	6.5	.6	21	1.0	7.4	5.4	.0	.0		22	0.6	
	5000		7.0	78	.26	.18	.28	.02	.42	.02	.21	.09		17.0	58	1	0.2	
					35	24	38	3	57	3	28	12						
	18N/01W-35C01 H																	
06/04/86	2694				--	--	7.7	--	--	6.0	8.5	39.0	--	--	87			
	3334			139			.33			.12	.24	.63		--				
	18N/01W-35C02 H																	
06/05/86	2694				--	--	5.1	--	--	6.0	6.0	20.0	--	--	62			
	3334			99			.22			.12	.17	.32		--				
	18N/01W-35E01 H																	
01/19/87	2694				--	--	6.0	--	--	8.0	10	39.0	--	--	83			
	3334			133			.26			.17	.28	.63		--				
	18N/01W-35F01 H																	
06/03/86	2694				--	--	6.3	--	--	5.0	8.7	33.0	--	--	77			
	3334			124			.27			.10	.25	.53		--				

MINERAL ANALYSES OF GROUND WATER

DATE TIME	SAMPLER LAB	TEMP	FIELD LABORATORY PH	FIELD LABORATORY EC	CA	MG	NA	K	CACO3	SO4	CL	NO3	B TURB	F SIO2	TDS SUM	TH NCH	SAR ASAR	REM
	F	NORTH COAST HB																
	F-03	SMITH RIVER HU																
	F-03.A	LOWER SMITH RIVER HA																
	F-03.A1	SMITH RIVER PLAIN HSA																
	18N/01W-35F02 H																	
					--	--	5.5	--	--	2.0	10	49.0	--	--	79			
11/07/86	2894						.24			.04	.28	.79		--				
	3334			130														
	18N/01W-35G01 H																	
					7.2	2.6	5.0	.4	26	--	7.0	--	--	--		29	0.4	
07/29/53	5050				.36	.21	.22	.01	.52		.20			--		3	0.2	
	5000		6.6	83	45	26	28	1										S
					--	--	6.1	--	--	7.0	8.8	27.0	--	--	84			
06/04/86	2894						.27			.15	.25	.44		--				
	3334			134														
	18N/01W-35J01 H																	
					--	--	5.2	--	--	2.0	7.6	4.4	--	--	45			
06/03/86	2894						.23			.04	.21	.07		--				
	3334			72														
	18N/01W-35K02 H																	
					--	--	6.1	--	--	6.0	7.7	24.0	--	--	82			
06/04/86	2894						.27			.12	.22	.39		--				
	3334			131														

Appendix E
Minor Element Analysis

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MINOR ELEMENT ANALYSES OF GROUND WATER

CONSTITUENTS IN MILLIGRAMS PER LITER

DATE TIME	SAMP LAB	DEPTH	DISCH EC	TEMP PH	ARSENIC	BARIUM CADMIUM	CHROM (ALL) CHROM (HEX)	COPPER IRON	LEAD MANGANESE	MERCURY SELENIUM	SILVER ZINC	REM
		F			NORTH COAST HB							
		F-01			WINCHUCK RIVER HU							
		18N/01W-05G01 H										
08/11/58	5050					--	--	--	--	--	--	
1505	5050				--	--	--	0.02 D	--	--	--	
08/27/59	5050					--	--	--	--	--	--	
1500	5000				--	--	--	0.30 T	--	--	--	
09/ /60	5050					--	--	--	--	--	--	
	5050				--	--	--	0.24 T	--	--	--	
08/30/61	5050					--	--	0.09 D	0.03 D	--	--	
1700	5050				0.00 D	--	--	0.18 T	0.00 D	--	0.11 D	
		18N/01W-05K01 H										
09/10/75	5050			58.0F		--	--	0.01 T	0.00 T	--	--	
1530	5050		183	6.1	--	0.00 T	--	0.09 T	0.04 T	--	0.03 T	
08/10/77	5000			14.5C		--	--	--	--	--	--	
	5000		145		--	--	--	0.00 D	--	--	--	
		F-03			SMITH RIVER HU							
		F-03.A			LOWER SMITH RIVER HA							
		F-03.A1			SMITH RIVER PLAIN HSA							
		16N/01W-02001 H										
06/23/58	5050					--	--	--	--	--	--	
1520	5050				--	--	--	0.47 D	--	--	--	
08/14/59	5050					--	--	--	--	--	--	
0910	5000				--	--	--	0.00 D	--	--	--	
08/14/59	5050					--	--	--	--	--	--	
0911	5000				--	--	--	8.1 T	--	--	--	
09/ /60	5050					--	--	--	--	--	--	
	5050				--	--	--	10. T	--	--	--	
08/29/61	5050					--	--	0.00 D	0.00 D	--	--	
1645	5050				0.00 D	--	--	0.72 T	0.00 D	--	0.02 D	
08/16/66	5050					--	--	--	--	--	--	
1515	5050				--	--	--	6.3 T	--	--	--	
09/25/72	5050			58.0F		--	--	0.01 D	0.01 D	--	--	
1445	5050		190		0.00 D	0.00 D	--	0.02 D	0.15 D	0.00 D	0.05 D	
08/10/77	5000			14.0C		--	--	--	--	--	--	
	5000		200		--	--	--	0.02 D	--	--	--	

MINOR ELEMENT ANALYSES OF GROUND WATER

CONSTITUENTS IN MILLIGRAMS PER LITER

DATE TIME	SAMP LAB	DEPTH	DISCH EC	TEMP PH	ARSENIC		BARIUM CADMIUM	CHROM (ALL) CHROM (HEX)	COPPER IRON		LEAD MANGANESE		MERCURY SELENIUM	SILVER ZINC		REM
* * *	* *	* *	* *	* *	* * *		* * *	* * *	* *		* * *		* * *	* * *		* *
16N/01W-07F01 H																
10/29/58	5050						--	--	--		--		--	--		
1230	5050				--		--	--	0.01	D	--		--	--		
09/14/59	5050						--	--	--		--		--	--		
1540	5000				--		--	--	0.00	D	--		--	--		
09/14/59	5050						--	--	--		--		--	--		
1541	5000				--		--	--	0.40	T	--		--	--		
09/ /60	5050						--	--	--		--		--	--		
	5050				--		--	--	2.7	T	--		--	--		
08/30/61	5050						--	--	0.00	D	0.00	D	--	--		
1430	5050				0.00	D	--	--	2.1	T	0.00	D	--	0.06	D	
16N/01W-15C01 H																
09/27/53	5050			53.0F			--	--	--		--		--	--		
	5000				--		--	--	0.17	T	--		--	--		
12/04/57	5050			53.0F			--	--	--		--		--	--		
	5000				--		--	--	0.01	T	--		--	--		
10/29/58	5050			56.0F			--	--	--		--		--	--		
1420	5050				--		--	--	0.	D	--		--	--		
10/ /59	5050						--	--	--		--		--	--		
	5000				--		--	--	0.00	D	--		--	--		
10/ /59	5050						--	--	--		--		--	--		
0001	5000				--		--	--	0.07	T	--		--	--		
09/ /60	5050						--	--	--		--		--	--		
1550	5050				--		--	--	4.8	T	--		--	--		
08/29/61	5050						--	--	0.02	D	0.00	D	--	--		
1615	5050				0.00	D	--	--	0.01	T	0.00	D	--	0.05	D	
16N/01W-16D01 H																
07/06/58	5050						--	--	--		--		--	--		
	5050				--		--	--	0.	D	--		--	--		
09/04/59	5050						--	--	--		--		--	--		
1400	5000				--		--	--	0.00	D	--		--	--		
09/04/59	5050						--	--	--		--		--	--		
1401	5000				--		--	--	0.23	T	--		--	--		
09/ /60	5050						--	--	--		--		--	--		
	5050				--		--	--	3.7	T	--		--	--		
08/29/61	5050						--	--	0.00	D	0.00	D	--	--		
1600	5050				0.00	D	--	--	0.09	T	0.00	D	--	0.46	D	

MINOR ELEMENT ANALYSES OF GROUND WATER

CONSTITUENTS IN MILLIGRAMS PER LITER

F
F-03
F-03.A
F-03.A1

NORTH COAST HR
SMITH RIVER HU
LOWER SMITH RIVER HA
SMITH RIVER PLAIN HSA

CONTINUED

DATE TIME	SAMP LAB	DEPTH	DISCH EC	TEMP PH	ARSENIC	BARIUM CADMIUM	CHROM (ALL) CHROM (HEX)	COPPER IRON	LEAD MANGANESE	MERCURY SELENIUM	SILVER ZINC	REM
16N/01W-17K01 H												
10/29/58	5050					--	--	--	--	--	--	
1310	5050				--	--	--	0.01 D	--	--	--	
09/18/59	5050					--	--	--	--	--	--	
1600	5000				--	--	--	0.04 T	--	--	--	
16N/01W-17K02 H												
09/24/80	5050			18.0C		--	--	--	--	--	--	
1345	5000		250	6.6	--	--	--	1.400 D	0.070 D	--	--	
16N/01W-18F01 H												
08/27/53	5050			53.0F		--	--	--	--	--	--	
	5000				--	--	--	2.3 T	--	--	--	
12/04/57	5050			53.0F		--	--	--	--	--	--	
	5000				--	--	--	0.05 T	--	--	--	
09/25/58	5050			53.0F		--	--	--	--	--	--	
	5800				--	--	--	0.13 T	--	--	--	
09/25/58	5050					--	--	--	--	--	--	
1550	5050				--	--	--	0.13 D	--	--	--	
16N/01W-19J01 H												
04/30/53	5050					--	--	--	--	--	--	
	5000				--	--	--	0.4 T	--	--	--	
16N/01W-20A01 H												
09/18/59	5050					--	--	--	--	--	--	
1645	5000				--	--	--	0.09 T	--	--	--	
16N/01W-20A02 H												
04/30/53	5050					--	--	--	--	--	--	
	5000				--	--	--	0.1 T	--	--	--	
12/04/57	5050					--	--	--	--	--	--	
	5000				--	--	--	0.00 D	--	--	--	
10/29/58	5050					--	--	--	--	--	--	
1145	5050				--	--	--	0. D	--	--	--	
09/ /60	5050					--	--	--	--	--	--	
	5050				--	--	--	0.14 T	--	--	--	
08/29/61	5050					--	--	0.02 D	0.00 D	--	--	
1500	5050				0.00 D	--	--	0.18 T	0.00 D	--	0.04 D	

MINOR ELEMENT ANALYSES OF GROUND WATER

CONSTITUENTS IN MILLIGRAMS PER LITER

DATE TIME	SAMP LAB	DEPTH	DISCH EC	TEMP PH	ARSENIC	BARIUM CADMIUM	CHROM (ALL) CHROM (HEX)	COPPER IRON	LEAD MANGANESE	MERCURY SELENIUM	SILVER ZINC	REM
16N/01W-20A03 H												
/ /61	5050					--	--	0.04 D	0.03 D	--	--	
	5050				0.00 D	--	--	0.05 T	0.00 D	--	0.16 D	
16N/01W-20B01 H												
04/30/53	5050					--	--	--	--	--	--	
	5000				--	--	--	0.4 T	--	--	--	
12/04/57	5050					--	--	--	--	--	--	
	5000				--	--	--	0.02 D	--	--	--	
16N/01W-20H01 H												
10/29/58	5050					--	--	--	--	--	--	
1000	5050				--	--	--	0. D	--	--	--	
09/18/59	5050					--	--	--	--	--	--	
1620	5000				--	--	--	0.08 T	--	--	--	
11/29/60	5050			57.0F		--	--	--	--	--	--	
1510	5050				--	--	--	0.78 T	--	--	--	
08/29/61	5050					--	--	0.00 D	0.00 D	--	--	
1530	5050				0.00 D	--	--	0.59 T	0.00 D	--	0.08 D	
08/10/77	5000			13.5C		--	--	--	--	--	--	
	5000		170		--	--	--	1.40 D	--	--	--	
16N/01W-21M01 H												
05/01/53	5050					--	--	--	--	--	--	
	5000				--	--	--	0.5 T	--	--	--	
12/04/57	5050					--	--	--	--	--	--	
	5000				--	--	--	0.10 D	--	--	--	
16N/01W-26D01 H												
10/20/59	5050					--	--	--	--	--	--	
1145	5000				--	--	--	0.07 T	--	--	--	
09/ /60	5050					--	--	--	--	--	--	
1610	5050				--	--	--	0.22 T	--	--	--	

MINOR ELEMENT ANALYSES OF GROUND WATER

CONSTITUENTS IN MILLIGRAMS PER LITER

DATE TIME	SAMP LAB	DEPTH	DISCH EC	TEMP PH	ARSENIC	BARIUM CADMIUM	CHROM (ALL) CHROM (HEX)	COPPER IRON	LEAD MANGANESE	MERCURY SELENIUM	SILVER ZINC	REM
		18N/01W-26D01 H										
09/04/58	5050					--	--	--	--	--	--	
1630	5050				--	--	--	1.48 D	--	--	--	
08/30/61	5050					--	--	0.05 D	0.03 D	--	--	
1650	5050				0.00 D	--	--	0.08 T	0.00 D	--	0.07 D	
		18N/01W-26H01 H										
08/10/77	5000			15.0C		--	--	--	--	--	--	
	5000		100		--	--	--	0.00 D	--	--	--	
		18N/01W-34M00 H										
08/10/77	5000			13.0C		--	--	--	--	--	--	
	5000		250		--	--	--	0.00 D	--	--	--	
		18N/01W-34M02 H										
08/11/58	5050					--	--	--	--	--	--	
	5050				--	--	--	0. D	--	--	--	
09/03/59	5050					--	--	--	--	--	--	
1340	5000				--	--	--	0.00 D	--	--	--	
09/03/59	5050					--	--	--	--	--	--	
1341	5000				--	--	--	0.02 T	--	--	--	
09/ /60	5050					--	--	--	--	--	--	
	5050				--	--	--	0.03 T	--	--	--	
08/30/61	5050					--	--	0.00 D	0.02 D	--	--	
1640	5050				0.00 D	--	--	0.02 T	0.00 D	--	0.07 D	
08/10/77	5000			15.0C		--	--	--	--	--	--	
	5000		230		--	--	--	0.00 D	--	--	--	
		18N/01W-35B01 H										
09/13/57	5050					--	--	--	--	--	--	
	5000				--	--	--	0.01 D	--	--	--	
		16N/01W-20H02 H										
04/30/53	5050					--	--	--	--	--	--	
	5000				--	--	--	0.0 T	--	--	--	

MINOR ELEMENT ANALYSES OF GROUND WATER

CONSTITUENTS IN MILLIGRAMS PER LITER

DATE TIME	SAMP LAB	DEPTH	DISCH EC	TEMP PH	ARSENIC	BARIUM CADMIUM	CHROM (ALL) CHROM (HEX)	COPPER IRON	LEAD MANGANESE	MERCURY SELENIUM	SILVER ZINC	REM
		F		NORTH COAST HB								
		F-03		SMITH RIVER HU								
		F-03.A		LOWER SMITH RIVER HA								
		F-03.A1		SMITH RIVER PLAIN HSA				CONTINUED				
		17N/01W-20P02 H										
11/06/62	5050					--	--	--	--	--	--	
1700	5050				--	--	--	0.30 T	--	--	--	
11/06/62	5050					--	--	0.02 D	0.02 D	--	--	
1701	5050				0.00 D	--	--	0.00 D	0.00 D	--	0.19 D	
		17N/01W-32M01 H										
10/29/58	5050					--	--	--	--	--	--	
1250	5050				--	--	--	1.3 D	--	--	--	
		18N/01W-05G01 H										
08/11/58	5050					--	--	--	--	--	--	
	5800				--	--	--	0.02 D	--	--	--	
		18N/01W-17R01 H										
10/ /59	5050					--	--	--	--	--	--	
	5000				--	--	--	0.01 D	--	--	--	
10/ /59	5050					--	--	--	--	--	--	
0001	5000				--	--	--	7.5 T	--	--	--	
/ /61	5050					--	--	0.05 D	0.03 D	--	--	
	5050				0.00 D	--	--	3.5 T	0.00 D	--	0.11 D	
		18N/01W-17R02 H										
10/29/58	5050					--	--	--	--	--	--	
1530	5050				--	--	--	0. D	--	--	--	
08/27/59	5050					--	--	--	--	--	--	
1500	5000				--	--	--	0.23 D	--	--	--	
08/27/59	5050					--	--	--	--	--	--	
1501	5000				--	--	--	2.6 T	--	--	--	
/ /61	5050					--	--	0.05 D	0.02 D	--	--	
	5050				0.00 D	--	--	3.9 T	0.00 D	--	0.00 D	

MINOR ELEMENT ANALYSES OF GROUND WATER

CONSTITUENTS IN MILLIGRAMS PER LITER

DATE TIME	SAMP LAB	DEPTH	DISCH EC	TEMP PH	ARSENIC		BARIUM CADMIUM	CHROM (ALL) CHROM (HEX)	COPPER IRON		LEAD MANGANESE		MERCURY SELENIUM	SILVER ZINC		REM
17N/01W-09R01 H																
07/18/58	5050						--	--	--		--		--	--		
1410	5050				--		--	--	0.01	D	--		--	--		
17N/01W-14C01 H																
10/29/58	5050						--	--	--		--		--	--		
1500	5050				--		--	--	0.	D	--		--	--		
08/14/59	5050						--	--	--		--		--	--		
	5000				--		--	--	0.01	T	--		--	--		
08/14/59	5050						--	--	--		--		--	--		
0955	5000				--		--	--	0.00	D	--		--	--		
09/15/60	5050						--	--	--		--		--	--		
1500	5050				--		--	--	0.09	T	--		--	--		
/ /61	5050						--	--	0.00	D	0.01	D	--	--		
	5050				0.00	D	--	--	0.03	T	0.00	D	--	0.22	D	
17N/01W-14C02 H																
05/10/77	5000			14.0C			--	--	--		--		--	--		
	5000		155		--		--	--	0.01	D	--		--	--		
09/08/78	5050			64.0F			--	--	0.12	T	0.00	T	--	--		
0930	5050		255	6.7	0.00	T	--	--	0.04	T	0.00	T	--	0.17	T	
17N/01W-15E01 H																
06/25/58	5050						--	--	--		--		--	--		
1450	5050				--		--	--	0.	D	--		--	--		
09/30/59	5050						--	--	--		--		--	--		
1500	5000				--		--	--	0.03	T	--		--	--		
08/30/61	5050						--	--	0.01	D	0.01	D	--	--		
1800	5050				0.00	D	--	--	0.04	T	0.00	D	--	0.08	D	

MINOR ELEMENT ANALYSES OF GROUND WATER

DATE TIME	SAMP LAB	DEPTH	DISCH EC	TEMP PH	ARSENIC	BARIUM CADMIUM	CHROM (ALL) CHROM (HEX)	COPPER IRON	LEAD MANGANESE	MERCURY SELENIUM	SILVER ZINC	REM
						CONSTITUENTS IN MILLIGRAMS PER LITER						
		F		NORTH COAST HR								
		F-03		SMITH RIVER HU								
		F-03.A		LOWER SMITH RIVER HA								
		F-03.A1		SMITH RIVER PLAIN HSA					CONTINUED			
		16N/02W-13E01 H										
08/10/77	5000			14.0C		--	--	--	--	--	--	
	5000		400		--	--	--	0.02 D	--	--	--	
		17N/01W-02G01 H										
09/15/58	5050					--	--	--	--	--	--	
1510	5050				--	--	--	0.01 D	--	--	--	
08/27/59	5050					--	--	--	--	--	--	
1330	5000				--	--	--	0.00 D	--	--	--	
08/27/59	5050					--	--	--	--	--	--	
1331	5000				--	--	--	0.68 T	--	--	--	
09/ /60	5050					--	--	--	--	--	--	
	5050				--	--	--	0.16 T	--	--	--	
08/31/61	5050					--	--	0.00 D	0.00 D	--	--	
1655	5050				0.00 D	--	--	0.02 T	0.00 D	--	0.12 D	
07/11/68	5050			55.0F		--	--	0.00 D	0.00 D	--	--	
0930	5050		115	6.5	0.00 D	--	--	0.00 T	0.00 D	--	0.00 D	
08/10/77	5000			12.5C		--	--	--	--	--	--	
	5000		101		--	--	--	0.01 D	--	--	--	
		17N/01W-03E01 H										
08/10/77	5000			13.0C		--	--	--	--	--	--	
	5000		270		--	--	--	0.02 D	--	--	--	
		17N/01W-04J01 H										
08/10/77	5000			13.0C		--	--	--	--	--	--	
	5000		260		--	--	--	0.06 D	--	--	--	
09/24/80	5050			16.0C		--	--	--	--	--	--	
1230	5000		345	7.3	--	--	--	0.010 D	0.008 D	--	--	
		17N/01W-09A01 H										
09/03/59	5050					--	--	--	--	--	--	
1300	5000				--	--	--	0.00 D	--	--	--	
09/03/59	5050					--	--	--	--	--	--	
1301	5000				--	--	--	0.11 T	--	--	--	
09/14/60	5050					--	--	--	--	--	--	
1530	5050				--	--	--	1.0 T	--	--	--	
08/30/61	5050					--	--	0.00 D	0.00 D	--	--	
1620	5050				0.00 D	--	--	0.02 T	0.00 D	--	0.06 D	

Appendix F
Water Quality Guidelines for Agriculture

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University of California
Cooperative Extension
January 15, 1975

WATER QUALITY

Guidelines for Interpretation of Water Quality for Agriculture (UC-Committee of Consultants)

Guidelines were originally distributed to Cooperative Extension staff in December 1973. Suggestions for needed changes, additions, and corrections have been made as received. The present "guidelines" are revised to January 15, 1975 and include -

1. Guidelines for Interpretation of Quality of Water for Irrigation.
2. Assumptions and Comments on "Guidelines".
3. Crop Tolerance and Leaching Requirement Tables - Field Crops.
4. " " " " " " - Vegetable Crops.
5. " " " " " " - Fruit Crops
6. " " " " " " - Forage Crops
7. Example - Use of Crop Tolerance Tables.
8. Boron in Irrigation Waters.
9. Tolerance of Ornamental Shrubs and Ground Covers to Salinity in Irrigation Water.
10. Recommended Maximum Concentrations of Trace Elements in Irrigation Waters.
11. Guide to Use of Saline Waters for Livestock and Poultry.
12. Guidelines To Levels of Toxic Substances in Drinking Water For Livestock.
13. Tables for Calculating pHc Values of Waters.

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Guidelines for Interpretation of Quality of Water for Irrigation

Interpretations are based on possible effects of constituents on crops and/or soils. Guidelines are flexible and should be modified when warranted by local experience or special conditions of crop, soil, and method of irrigation.

TABLE A-1

PROBLEM AND RELATED CONSTITUENT	WATER QUALITY GUIDELINES		
	No Problem	Increasing Problems	Severe Problems
Salinity[1/]			
EC_w of irrigation water, in millimhos/cm	<0.75	0.75–3.0	>3.0
Permeability			
EC_w of irrigation water, in mmho/cm	>0.5	<0.5	<0.2
adj.SAR[2/]	<6.0	6.0–9.0	>9.0
Specific Ion Toxicity[3/]			
from ROOT absorption			
Sodium (evaluate by adj.SAR)	<3	3.0–9.0	>9.0
Chloride (me/L)	<4	4.0–10	>10
(mg/L or ppm)	<142	142–355	>355
Boron (mg/L or ppm)	<0.5	0.5–2.0	2.0–10.0
from FOLIAR absorption[4/] (sprinklers)			
Sodium (me/L)	<3.0	>3.0	--
(mg/L or ppm)	<69	>69	--
Chloride (me/L)	<3.0	>3.0	--
(mg/L or ppm)	<106	>106	--
Miscellaneous[5/]			
NH_4-N, NO_3-N mg/L or ppm for sensitive crops	<5	5–30	>30
HCO_3 (me/L) (only with overhead sprinklers)	<1.5	1.5–8.5	>8.5
(mg/L or ppm)	<90	90–520	>520
pH	normal range = 6.5–8.4		--

1/ Assumes water for crop plus needed water for leaching requirement (LR) will be applied. Crops vary in tolerance to salinity. Refer to tables for crop tolerance and LR. (mmho/cmX640 = approximate total dissolved solids (TDS) in mg/L or ppm; mmhoX1000 = micromhos)

2/ adj.SAR (Adjusted Sodium Adsorption Ratio) is calculated from a modified equation developed by U. S. Salinity Laboratory to include added effects of precipitation or dissolution of calcium in soils and related to $CO_3 + HCO_3$ concentrations.

To evaluate sodium (permeability) hazard:

$$\frac{Na}{\sqrt{\frac{Ca + Mg}{2}}} \left[1 + (8.4\ pHc)\right]$$

pHc is a calculated value based on total cations. Ca + Mg, and CO_3+HCO_3. Calculating and reporting will be done by reporting laboratory.
NOTE: Na, CA+Mg, CO_3+HCO_3 should be in me/L.

Permeability problems, related to <u>low LC</u> or <u>high adj.SAR</u> of water, can be reduced if necessary by adding gypsum. Usual application rate per acre-foot of applied water is from 200 to about 1,000 lbs. (234 lbs of 100% gypsum added to 1 acre-foot of water will supply 1 me/L of calcium and raise the EC_w about 0.1 mmho.) In many cases a soil application may be needed.

3/ Most tree crops and woody ornamentals are sensitive to sodium and chloride (use values shown). Most annual crops are not sensitive (use salinity tolerance tables). For boron sensitivity, refer to boron tolerance tables.

4/ Leaf areas wet by sprinklers (rotating heads) may show a leaf burn due to sodium or chloride absorption under low humidity, high-evaporation conditions. (Evaporation increases ion concentration in water films on leaves between rotations of sprinkler heads.)

5/ Excess N may affect production or quality of certain crops, e.g. sugar beets, citrus, avocados, apricots, grapes, etc. (1 mg/L NO_3-N = 2.72 lbs. N/acre-foot of applied water.) HCO_3 with overhead sprinkler irrigation may cause a white carbonate deposit to form on fruit and leaves.

Symbol	Name	Symbol	Name	Equiv. Wt.
EC_w	Electrical Conductivity of water	Na	Sodium	23.00
mmho/cm	millimho per centimeter	Ca	Calcium	20.04
<	less than	Mg	Magnesium	12.16
>	more than	CO_3	Carbonate	30.00
mg/L	milligrams per liter	HCO_3	Bicarbonate	61.00
ppm	parts per million	NO_3-N	Nitrate-nitrogen	14.00
LR	Leaching Requirement	Cl	Chloride	35.45
me/L	milliequivalents per liter			
TDS	Total Dissolved Solids	17.1 ppm = 1 grain per gallon		

Assumptions and Comments on Guidelines for Interpretation of Quality of Water for Irrigation Developed by University of California Committee of Consultants

1. These "guidelines" are flexible and intended for use in estimating the potential hazards to crop production associated with long-term use of the particular water being evaluated. Guidelines should be modified when warranted by local experience and special conditions of crop, soil, method of irrigation, or level of soil-water-crop management. Changes of 10 to 20 percent above or below an indicated guideline value may have little significance if considered in proper perspective along with all other variables that enter into a yield of crop.

2. It is assumed that the water will be used under average conditions--soil texture, internal drainage, total water use, climate, and salt tolerance of crop. Large deviations from the average might make it unsafe to use water which under average conditions would be good, or might make it safe to use water, which under average conditions would be of doubtful quality.

3. The divisions into "No problem--Increasing Problem--Severe Problem" is more-or-less arbitrary, as well as carefully controlled greenhouse and small plot research conducted by various researchers over the past 40 years or more. Guidelines of one sort or another have been proposed by U. S. Geological Survey, University of California, U. S. Salinity Laboratory, and many others starting as early as 1911. As new research and observations have developed additional information for assessing water quality, guidelines have been modified.

4. These guidelines apply to surface irrigation methods such as furrow, flood, basin, sprinklers, or any other which applies water on an "as-needed" basis and which allows for an extended dry-down period between

irrigations during which the crop uses up a considerable portion of the available stored water.

5. The guidelines incorporate some of the newer concepts in soil-plant-water relationships as recently developed at U. S. Salinity Laboratory. Uptake of water occurs mostly from the upper two-thirds of the rooting depth of crops (the "more-active" part of the root zone). Each irrigation normally will leach this upper soil area and maintain it at relatively low salinity. Salts applied in the irrigation water under reasonable irrigation management concentrate in the soil water in this active root zone to about three times the concentration of the applied irrigation water and the salinity of this root area is representative of the salinity levels to which the plant responds. The salinity of the lower root zone is of less importance as long as plants are reasonably well supplied with moisture in the upper, more active, root zone.

These guidelines represent the 1974 consensus of the UC Committee of Consultants. It is recognized they are not perfect and it is expected they will be modified from time to time as further knowledge and experience dictate.

TABLE F-2

RECOMMENDED MAXIMUM CONCENTRATIONS OF TRACE ELEMENTS IN IRRIGATION WATERS 1/

Element	For Waters Used Continuously on All Soil mg/l	For Use Up to 20 Years on Fine Textured Soils of pH 6.0 to 8.5 mg/l
Aluminum	5.0	20.0
Arsenic	0.10	2.0
Beryllium	0.10	0.50
Boron	0.75	2.0
Cadmium	0.010	0.050
Chromium	.10	1.0
Cobalt	.050	5.0
Copper	0.20	5.0
Fluoride	1.0	15.0
Iron	5.0	20.0
Lead	5.0	10.0
Lithium	2.5 2/	2.5 2/
Manganese	0.20	10.0
Molybdenum	0.010	0.050 3/
Nickel	0.20	2.0
Selenium	0.020	0.020
Vanadium	0.10	1.0
Zinc	2.0	10.0

1/ These levels will normally not adversely affect plants or soils. No data available for mercury, silver, tin, titanium, tungsten.

2/ Recommended maximum concentration for irrigating citrus is 0.075 mg/l.

3/ For only acid fine-textured soils or acid soils with relatively high iron oxide contents.

Source: Above data based on Environmental STudies Board, Nat. Acad. of Sci., Nat. Acad. of Eng. "Water Quality Criteria 1972" (U. S. Gov't. Print. Off., Washington, D. C. 20402), p. 339.

TABLE F-3

GUIDE TO THE USE OF SALINE WATERS FOR LIVESTOCK AND POULTRY 1/

Total Soluble Salt Content of Waters (mg/l)	
Less than 1,000 mg/l (EC less than 1.5) 2/	Relatively low level of salinity. Excellent for all classes of livestock and poultry.
1,000-2,999 (EC = 1.5-5)	Very satisfactory for all classes of livestock and poultry. May cause temporary and mild diarrhea in livestock not accustomed to them or watery droppings in poultry.
3,000-4,999 (EC = 5-8)	Satisfactory for livestock, but may cause temporary diarrhea or be refused at first by animals not accustomed to them. Poor waters for poultry, often causing water feces, increased mortality and decreased growth, especially in turkeys.
5,000-6,999 (EC = 8-11)	Can be used with reasonable safety for dairy and beef cattle, for sheep, swine, and horses. Avoid use for pregnant or lactating animals. Not acceptable for poultry.
7,000-10,000 (EC = 11-16)	Unfit for poultry and probably for swine. Considerable risk in using for pregnant or lactating cows, horses, or sheep, or for the young of these species. In general, use should be avoided although older ruminants, horses, poultry, and swine may subsist on them under certain conditions.
Over 10,000 (EC over 16)	Risks with these highly saline waters are so great that they cannot be recommended for use under any conditions.

1/ Environmental Studies Board, Nat. Acad. of Sci, Nat. Acad. of Eng. "Water Quality Criteria 1972" (U. S. Gov't. Print. Off., Washington, D. C. 20402), p. 308.

2/ EC values shown are reported as mmho/cm and are only approximations based on rough conversion of given mg/l to EC by mg/l ÷ 640 = EC.

TABLE F-4

GUIDELINES TO LEVELS OF TOXIC SUBSTANCES IN DRINKING WATER FOR LIVESTOCK 1/

Constituent	Upper Limit
Aluminum (Al)	5 mg/1
Arsenic (As)	0.2 mg/1
Beryllium (Be)	No data
Boron (B)	5.0 mg/1
Cadmium (Cd)	.05 mg/1
Chromium (Cr)	1.0 mg/1
Cobalt (Co)	1.0 mg/1
Copper (Cu)	0.5 mg/1
Fluoride (F)	2.0 mg/1
Iron (Fe)	No data
Lead (Pb)	0.1 mg/1 2/
Manganese (Mn)	No data
Mercury (Hg)	.01 mg/1
Molybdenum (Mo)	0.5 mg/1
Nitrate + Nitrite (NO_3-N+NO_2-N)	100 mg/1
Nitrite (NO_2-N)	10 mg/1
Selenium (Se)	0.05 mg/1
Vanadium (Va)	0.10 mg/1
Zinc (Zn)	25 mg/1
Total Dissolved (TDS) Solids	10,000 mg/1 3/

1/ Based primarily on Environmental Studies Board, Nat. Acad. of Sci., Nat. Acad. of Eng., "Water Quality Criteria 1972" (U. S. Gov't. Print. Off., Washington, D. C. 20402), p. 309-317.

2/ Lead is accumulative and problems may begin at threshold value = 0.05 mg/1.

3/ See "Guide to Use of Saline Waters for Livestock and Poultry", included as separate "Guide".

CONVERSION FACTORS

Quantity	To Convert from Metric Unit	To Customary Unit	Multiply Metric Unit By	To Convert to Metric Unit Multiply Customary Unit By
Length	millimetres (mm)	inches (in)	0.03937	25.4
	centimetres (cm) for snow depth	inches (in)	0.3937	2.54
	metres (m)	feet (ft)	3.2808	0.3048
	kilometres (km)	miles (mi)	0.62139	1.6093
Area	square millimetres (mm^2)	square inches (in^2)	0.00155	645.16
	square metres (m^2)	square feet (ft^2)	10.764	0.092903
	hectares (ha)	acres (ac)	2.4710	0.40469
	square kilometres (km^2)	square miles (mi^2)	0.3861	2.590
Volume	litres (L)	gallons (gal)	0.26417	3.7854
	megalitres	million gallons (10^6 gal)	0.26417	3.7854
	cubic metres (m^3)	cubic feet (ft^3)	35.315	0.028317
	cubic metres (m^3)	cubic yards (yd^3)	1.308	0.76455
	cubic dekametres (dam^3)	acre-feet (ac-ft)	0.8107	1.2335
Flow	cubic metres per second (m^3/s)	cubic feet per second (ft^3/s)	35.315	0.028317
	litres per minute (L/min)	gallons per minute (gal/min)	0.26417	3.7854
	litres per day (L/day)	gallons per day (gal/day)	0.26417	3.7854
	megalitres per day (ML/day)	million gallons per day (mgd)	0.26417	3.7854
	cubic dekametres per day (dam^3/day)	acre-feet per day (ac-ft/day)	0.8107	1.2335
Mass	kilograms (kg)	pounds (lb)	2.2046	0.45359
	megagrams (Mg)	tons (short, 2,000 lb)	1.1023	0.90718
Velocity	metres per second (m/s)	feet per second (ft/s)	3.2808	0.3048
Power	kilowatts (kW)	horsepower (hp)	1.3405	0.746
Pressure	kilopascals (kPa)	pounds per square inch (psi)	0.14505	6.8948
	kilopascals (kPa)	feet head of water	0.33456	2.989
Specific Capacity	litres per minute per metre drawdown	gallons per minute per foot drawdown	0.08052	12.419
Concentration	milligrams per litre (mg/L)	parts per million (ppm)	1.0	1.0
Electrical Conductivity	microsiemens per centimetre (uS/cm)	micromhos per centimetre	1.0	1.0
Temperature	degrees Celsius (°C)	degrees Fahrenheit (°F)	$(1.8 \times °C)+32$	$(°F-32)/1.8$